SEP 28 43

QC
883
.27

VOLUME 71 [W. B. No. 1891] NUMBER 6

UNITED STATES DEPARTMENT OF COMMERCE
JESSE H. JONES, *Secretary*
WEATHER BUREAU - - F. W. Reichelderfer, *Chief*

# MONTHLY WEATHER REVIEW

## JUNE 1943

CONTENTS

| | Page |
|---|---|
| NOVEL AMERICAN CLIMATIC MAPS AND THEIR IMPLICATIONS. (22 figs.) Stephen S. Visher | 81 |
| METEOROLOGICAL AND CLIMATOLOGICAL DATA: | |
| Aerological Observations | 93 |
| River Stages and Floods | 99 |
| Climatological Data | 103 |
| SOLAR RADIATION AND SUNSPOT DATA: | |
| Solar Radiation Observations | 111 |
| Positions, Areas, and Counts of Sunspots | 112 |
| Provisional Relative Sunspot Numbers for February, March, April, and May 1943 | 113 |
| CHARTS I–VI | |

For sale by the Superintendent of Documents, U. S. Government Printing Office
Washington, D. C. - See page 4 of cover for prices

# MONTHLY WEATHER REVIEW

Editor, EDGAR W. WOOLARD

VOL. 71, No. 6
W. B. No. 1391

JUNE 1943

CLOSED AUGUST 5, 1943
ISSUED SEPTEMBER 5, 1943

## NOVEL AMERICAN CLIMATIC MAPS AND THEIR IMPLICATIONS

BY STEPHEN S. VISHER

[Professor of Geography, Indiana University, Bloomington, Ind., October 1942]

Analysis is here attempted in two chief ways of data accumulated during the 40 years 1899–1938 at about 5,000 American Weather Bureau stations. Many of these data were mapped, under the direction of J. B. Kincer of the Weather Bureau, in the 1941 Yearbook of Agriculture, "Climate and Man." Numerous regional correspondences and contrasts between various of these mapped data and of others partly derived therefrom are here pointed out, with the help of original maps. The climatological problems of the regional differences disclosed by the maps are briefly discussed.

The Kincer maps and those here given afford a more adequate basis for several sorts of climatological discussion than was available to earlier workers on the climate of the United States.

### LOW TEMPERATURES

Map 1 shows that in a narrow southern zone the average January temperatures are about 50°, the mean minima about 20°, the absolute minima about 0°, and the average frost penetration is about 1 inch. These four isolines show that the influence of the Atlantic is less evident upon average January temperature than upon the others. The influence of the Pacific is conspicuous, as the isotherms for mean minima and absolute minima which cross northwestern Florida also cross western Washington and Oregon. The northwestern region has, however, distinctly lower average January temperatures than prevail in northern Florida.

In the middle zone of map 1, the associated isotherms are those of 30° (average January), 0° ( mean minima), −20° (absolute minima), and 10 inches of frost penetration. Thus the temperature gaps or spread are about the same as in the southern zone, about 50° between January and the absolute minima, and about 30° between average and mean minima.

The effects of the Pacific Ocean and of the Great Lakes in interfering with low temperatures is made conspicuous by the northern isolines of figure 1. The coldest large area in the United States in winter is between the Rocky Mountains and Lake Superior. In most of that region, mean January temperatures are below 10°, mean minima below −30°, absolute minima below −50° and frost penetration ranges from 35 to 70 inches. The isotherms of that region correspond much less closely than in the other zones of this map: minima are relatively lower at the west than at the east, absolute minima notably lower in Wyoming than in Minnesota, and the gap or spread between the annual minima and the January average is relatively greater in Montana than in Wisconsin. This is partly a result of the higher elevation at the west, and partly because of the lesser atmospheric humidity in cold weather. The lowest average January temperature is, however, experienced in an area less than 1,000 feet above sea level, in the Red River Valley Basin. On the other hand, the absolute minima (at stations with long records) are at 2,000 feet (−63° at Poplar, Mont., in the Missouri River Valley), at about 5,000 feet (−60° in the Gallatin Valley of Montana), and at 6,690 feet (−66° at west Yellowstone Park). These are all inversion centers.

Another irregularity shown by the northern zone of map 1 is in average depth of freezing, which is distinctly less at the west than at the east, with corresponding temperatures. This is despite the fact that average snowfall increases eastward from Montana, and snow-cover protects the soil from deep freezing. In the three areas where −60° has been recorded, average frost penetration is only about 35 inches, in contrast with about 70 inches in northern Maine and in southern Minnesota, where minima are about −40°. The drier western soil is a better nonconductor than is the moister eastern soil, partly because dry soil does not crack so deeply in cold weather.

Map 2 shows regional contrasts in the difference between mean January temperatures and mean annual minima. For most of the country the difference is approximately 40°; in the Great Lakes and coastal region it is however, distinctly less than 40°, and in a northern Great Plains area it is from 45° to 50°. On the seacoast it is about 30° on the Atlantic and Gulf, and 20° on the Pacific. This map shows, therefore, in another way, that the continent's interior cools in cold weather relatively sharply, as compared with the average for January.

### HIGH TEMPERATURES

The isotherms for average July air and wet-bulb temperatures, and for average and absolute maxima, follow such irregular courses that there are no distinct zones on a map showing all four sets of isotherms. Hence map 3 shows only isotherms of average July air and wet-bulb temperatures. It shows that July wet-bulb temperatures are about 75° near the Gulf, between 60° and 65° in most of the North, and about 55°–60° in most of the West. July air temperatures average between 80° and 85° in the South, about 70° in the North, and 60°–70° in the West. Map 4, showing the average difference between July wet-bulb and air temperatures, reveals that in the arid Southwest, wet-bulb temperatures are 15°–20° below air temperatures; but along the Pacific coast, in the Northeast, and in part of the North, the difference is less than 5°. The gap is about the same in the Southeast as in Wisconsin, but the higher air temperatures in the South-

543645—43——1

east makes the sensible temperature more trying. For most people, under usual shade conditions, a wet-bulb temperature of 60° is not hot, while one of 70° is trying, and one of 75° distinctly enervating. Despite their far higher average air temperatures, northern Arizona and New Mexico have lower wet-bulb temperatures than have even Maine and the upper peninsula of Michigan. At Yuma, Ariz., however, the average July air temperature is so high (92°) that the average July wet-bulb temperature is as high as in northern Georgia and at Norfolk, Va.

The maps of average and absolute maxima show so little latitudinal or regular longitudinal contrast (despite a range in the United States of more than 25° for the average maxima and more than 30° for the absolute maxima) that the map made by superimposing the two sets of isotherms is not published here. Instead, some of the revelations are briefly described.

There is only slight average latitudinal contrast in annual maxima, an average difference of only about 5° between the southern and northern margins of the country. East of the 100th meridian, the average annual maxima along the Canadian border are about 94°, along the Gulf of Mexico about 98°. Midway between, the average annual maxima are about 100°, except in the Great Plains States where they are about 105°. The coolest northern areas are the North Pacific coast (where the average is about 85°), northwestern Maine (where the average is not quite 90°), and near the Great Lakes (where it is about 95°). Along the southern border, the average annual maxima are only 95° at Miami, Fla., are somewhat less than 100° along the Gulf coast, are about 105° along most of the Mexican border, but are 115° in a sizable southwestern area to the north of Yuma.

Comparison of the absolute and annual maxima reveals that most of the country has had maxima only 5° to 10° higher than the mean annual maxima. This difference is only a fourth to a ninth that between the annual and extreme minima (map 2). The map, not here reproduced, showing the spread between mean annual and absolute maxima shows that west to about longitude 85°, the spread is about 5°, except in northern New England where it is 10°; in the Midwest, it is 10°–15°, in the Southwest about 10°, and in the rest of the country, from 3°–9°.

The hottest minute of an average year is almost as hot as the hottest minute of 40 years, chiefly because at the high temperatures attained, radiation is so rapid as to interfere seriously with the attainment of higher temperatures. (According to the Stefan-Baltzmann law, a black body loses heat by radiation proportionately to the fourth power of its absolute temperature.) Significant also is the fact that when most intense, solar heating is soon checked by decline in the height of the sun, and often by convectional clouding.

A map of the spread between annual and extreme minima, which corresponds to the map just described, may be briefly described. It shows that in most of the country, the absolute minima were 15°–20° lower than the annual minima. The spread was less than 10° only along the Pacific coast, in southern Texas and Florida, in New York and locally near the Great Lakes. It was 25° or more in two areas, one extending from southern Montana to Nevada, and a small one centering in northern South Carolina.

The fact that the downward spread between mean and extreme minima averages two or three times as great as the upward spread between mean and extreme maxima shows that deficiency of heat is easier to attain than excess. The almost negligible effect of the Gulf and of the Atlantic is the most notable because of the conspicuous influence of the Pacific Ocean. The fact that downward departure is greater in the Southeast than in the Northeast reflects the rareness of intense cold in the former area, a result of the fact that polar air masses usually get warmed before reaching the Southeast.

Figure 5 maps the spread between the July average temperature and the mean annual maxima. It shows an increase from the Gulf coast northward and also northwestward, almost to the Pacific. In a sizable northwestern zone the spread is almost twice as great as near the Gulf. For most of the country it is about two-thirds as great as the spread between the January mean and mean minima (map 2). Comparison of maps 2 and 5 discloses lessened significance of the Pacific Ocean in map 5 and radical differences as to the Great Lakes. The relative highness of July mean maxima in the West than in the Southeast reflects humidity contrasts. The average increase with latitude accompanies the increase in length of day.

Absolute maxima are higher in northern Maine than in southern Florida, in northern North Dakota than in southern Texas, and in central Washington than in southwestern California. This is partly because at the summer solstice the day is 2 hours longer in latitude 49° than in latitude 30°. Significant also is the proximity of the ocean to these southern areas but not to these northern ones. Moreover midday cloudiness and showers are more frequent in the South than in the North.

Likewise, of some significance, is the greater width of the continent at the north than at the south, and generally southwesterly winds in hot weather.

The average absolute maxima are about 100° both along the Gulf coast and along the Canadian border east of Minnesota; they are approximately 105° for most of the remainder of the East except an area extending from Indiana to Louisiana, where 110° to 118° have occurred. A zone extending from North Dakota and Montana to southern Texas has had 110° to 120°, as have the arid areas in eastern California and central Washington. Absolute maxima below 100° have prevailed, however, in a large western elevated area extending from western Montana to New Mexico.

For stations having long records, the extreme maxima were 134° in Death Valley, Calif., 130° in the Imperial Valley, Calif., and 127° at two Arizona stations, all four in true deserts. The absolute maxima in some normally semiarid or humid areas are also high. Examples are 121° in Kansas, 117° in northern Montana, 116° in northern Indiana, 111° in Pennsylvania, 106° in Maine. These places were all abnormally dry, however, at the time these records were established.

### ANNUAL RANGE OF TEMPERATURE

The next three maps show temperature ranges of three magnitudes. Figure 6 shows that in much of the North, July averages about 50°–60° warmer than January but that near the Gulf and the Pacific the difference is only 20°–30°. The greatest range is near the continent's center, but the effect of the Atlantic and of the Great Lakes is not prominent.

Map 7, the range between mean maxima and minima, shows contrasts near the Pacific and Gulf three times as large as those of map 6, and in the interior of the continent somewhat more than twice the contrast. The effect of the Atlantic and the Great Lakes hence is more pronounced;

the latter influence helps to explain the westward shift of the area of greatest range.

Map 8, the absolute range (during 40 years) shows that almost everywhere except on the immediate Pacific and Gulf and southern Atlantic coasts the range has been more than 100°, for most of the country it has been more than 130°, in the northern Great Plains, more than 160°. This most extreme area is somewhat further west than the corresponding parts of maps 6 and 7.

Although in the central longitudes (95°–110°), there is a rather steady northward increase in range, the northward increase is broken in the eastern half of the country by the Great Lakes, parts of which area has no more extreme range than does central Texas. Near the Pacific cost the latitudinal effect is lacking; instead, a sharp increase occurs with increasing distance from the ocean.

Map 9 shows the spread or difference between the annual normal range (fig. 6) and the extreme range (fig. 8). It shows that the Pacific coastal zone occasionally has greater departures from normal than is true for most of the country. Occasionally the moderating influence of the ocean is overcome by winds off the continent. The relatively large contrasts shown for part of the Southeast reflect rare exceptionally cold air masses, or exceptional drouth, permitting abnormal heating or cooling.

State extreme ranges are of sufficient interest to justify a summary. Both Montana and Wyoming have State ranges, among stations with long records, of 180° (from −63° to 117°; −66° to 114°); for New York, the range is 160° (−52° to 108°); for Indiana, 149° (−33° to 116°); for Tennessee, 145° (−32° to 113°); for Georgia, 123° (−12° to 111°); even for Florida the range is 111° (−2° to 109°). For California, partly because of contrast in elevation, latitude, and proximity to the ocean, the range is 170° (−36° to 134°); for Utah it is 166° (−50° to 116°); for Arizona and Washington it is 160° (−33° to 127°; −42° to 118°).

## ANNUAL PRECIPITATION

The next 6 maps present data as to annual precipitation. The aim of this series is to discover facts as to the variation between wet and dry years, the regional contrasts therein, and something as to causes.

Map 10 superimposes selected isohyets for "relatively wet" and "relatively dry" years. (Whenever "relatively dry" is used here, it connotes a year so dry that only one-eighth of the years receive less precipitation than that shown for the dry year. Conversely "relatively wet" signifies that only one-eighth of the years receive more than that shown for the wet year.) This map shows five vague belts east of the Rocky Mountains in which isohyets are rather close together. Consequently it indicates the amount of the range from wet to dry reasonably to be expected in many areas. For example, in a zone extending from Maine to southeastern Kansas and thence due south to the Gulf, the total in a relatively wet year is about 50 inches, in a relatively dry year about 30 inches.

The precipitation contrast or spread between relatively wet and relatively dry years is shown in map 11. This map shows that the difference is greatest in the southern Appalachians and near the Gulf of Mexico, where it is more than 30 inches. It is 25–30 inches on the North Pacific coast. For most of the Northeast it is approximately 15 inches, and for most of the northwest quarter less than 10 inches.

Map 11 shows that the absolute precipitation range decreases roughly with annual precipitation, but at a slower rate in the Southeast than in the rainy Northwest, where the orographic influence is pronounced.

Map 12 considers the relative or percentage variation between relatively wet and dry years. It has quite a different appearance than map 11, where the absolute variation is mapped. Map 12 shows that the part of the country with the least variable precipitation in three-fourths of the years is that bordering the eastern Great Lakes, where the variation is less than 30 percent of the annual average precipitation. In the Southwest, however, the range is 100 percent—as great as the annual average precipitation; part of it has a 300 percent variation. This map reveals a general southward increase in variability. Exceptions are the southern Appalachians, the northern Great Plains, and the Puget Sound, which have more variation than their surroundings. Conversely, some of the Rocky Mountains have less variability than nearby lowlands.

The variability of annual precipitation is illustrated in additional ways by maps 13 and 14. Map 13 shows that in a relatively wet year, the Mississippi Delta receives 20 inches more than normal while, conversely, most of New York receives only 3 inches more than normal. Map 14 shows that in a relatively dry year the Great Lakes region receives about 5 inches less precipitation than normal while the eastern Gulf coast receives 15 inches less. The deficiency is even greater in the southern Appalachians, while in the northern Pacific coastal zone more than 20 inches less is received in a relatively dry year than in a relatively wet year. Comparison of maps 13 and 14 shows that the plus (upward) and minus (downward) departures from normal are approximately equal in magnitude in most of the country but that the downward departure is relatively heavy in the wetter regions. This map brings out a seldom recognized point—that a relatively dry year in the North has a deficiency comparable to that occurring in much of the semiarid and arid West, while a relatively dry year in the South has two or three times as great a deficiency as has the North and the Northern Great Plains.

Map 15 shows that the percentage of the years having less than 15 inches of precipitation increases rapidly westward from about the 95th meridian, east of which no year is that dry, to the 105th–110th meridians, west of which 75–100 percent of the years are generally that dry. The two dashed lines on map 14 show the drier limits of the regions in which the annual totals are "always" above 20 inches.

Map 15 shows marked longitudinal influence, while latitudinal influences are indicated vaguely in both the eastern and western halves. The latitudinal influence in the East is associated with increased distance from the chief source of moisture, the Gulf of Mexico; that in the West is largely due to more effective cyclonic influence toward the north, which is in small part associated with the Columbia Gorge through the Cascade Range.

Maps 10–15 lend support to the generalization first deduced from other evidence as to the greater average variability of tropical than of mid-latitude climates.[1]

Maps 10–15 lend little support to the common generalization that precipitation is especially erratic in dry regions and is relatively dependable in humid regions. Instead, these data indicate that in the years here studied, the absolute difference decreased sharply in three-fourths of the years from humid to arid, and the percentage variation averaged about the same in arid, semiarid, and humid regions. Wet and dry years of notably more extreme types than are here studied occur, however, and

[1] S. S. Visher: Variability of Tropical Climates, *Meteorological Magazine* (London), vol. 58, 1923, pp. 21–26, 154–159, 178–180. Vergleichung der Niederslagsveranderlichkeit in Niedrigen und Mittleren Breiten, *Meteorol. Zeitschrift*, vol. 41, 1924, pp. 46–49.

it is these exceptionally wet and dry years that have given rise to the generalization that variation increases with aridity. In the wettest year of the half century 1889–1938 as compared with the driest year in that half century, State averages show that most of the western half of the country has somewhat more range than the eastern half (fig. 16). In most of the East, about twice as much precipitation was received in the wettest year as in the driest, while in the West the spread averages about 2.5-fold. It was, however, less than twofold in the three Northwestern States, and was nearly 50 percent greater in Virginia than in Oregon or Washington. In the Southwest it was nearly threefold; in Nevada (4.9″ vs. 14.1″), 3.5-fold in Arizona (7.8″ vs. 27.8″) and fourfold in California (10.4″ vs. 42.1″). It was least in the Northeast, slightly less than 1.5-fold in New England, New York, and Michigan, but was only slightly more in Florida (1.6). In the Great Plains it increased southward from North Dakota (2.5) to Texas (2.8).

Hence the regional increase in variability shown by map 16, of the spread between the driest and wettest years of a half century, is from north southward (except in a part of the East) and from the coast inland (except for the Southwest).

### SEASONAL PRECIPITATION

The Yearbook maps of the average precipitation in each of the seasons of the year reveal conspicuous contrasts. In summer less than an inch is received in most of California, in contrast with a winter total of somewhat more than 6 inches in southern California and one of 20 to 30 inches in northern California. In Western Washington and Oregon, the seasonal range is from an average of about 4 inches in summer to an average of about 35 inches in winter. The Great Plains receives less than 2 inches in winter but 6 to 8 inches in the average summer.

It is less well known that Florida normally receives nearly three times as much rain in summer as in winter (about 22 inches compared with 8 inches). Much of Arizona also receives about three times as much in summer as in winter (6″ vs. 2″). The Great Basin Region receives in winter, however, about twice as much as in summer, but the totals are small (about 2 inches compared with about 1 inch).

The amount of precipitation in autumn is intermediate between summer and winter in much of the country. Autumn on the North Pacific coast resembles winter rather than summer, but the reverse is true in southern California and in Florida.

The precipitation totals in spring are generally intermediate between those of winter and summer; in Florida, however, the totals received in spring are only a little more than for winter and are less than half those for summer.

An analysis of the seasonal data mapped by Kincer discloses several hitherto unrecognized conditions and raises some challenging climatological problems.

Map 17 shows the location of areas of relatively heavy and relatively light precipitation in each season. The approximate superposition of these areas reveal their seasonal shifts. The southeastern area of heavy winter rainfall (centering in the State of Mississippi which receives 17 inches, or more than any other part of the country except western Washington and Oregon), is succeeded in spring by an area of about the same size and total precipitation, centering somewhat northwest of the center for winter. In summer, the area with more than 14 inches of precipitation is situated to the east of the winter and spring areas. To the northwest, however, is an area which receives 12 to 14 inches, appreciably more than the adjacent regions. It extends from western Wisconsin to Arkansas. In autumn, the area of relatively heavy precipitation is situated between, or overlapping, the areas of heavy winter and relatively heavy summer precipitation. It centers in southern Missouri, and receives 10 inches or more.

Conversely as to areas of little precipitation, map 17 shows a distinct southwestward seasonal shift. Least winter precipitation occurs in a broad longitudinal zone mostly in the Great Plains, where less than 2 inches of precipitation is received in the 3 months. In spring, the region receiving less than 2 inches is situated to the southwest of the dry winter belt. In summer, it is situated still farther southwest, including much of the Pacific States but not extending east to the Rockies. In autumn, the area receiving less than 2 inches is much smaller and largely limited to the Great Basin.

Map 17 shows that little more than the continually arid area (in Nevada and just south thereof), normally receives less than 2 inches of precipitation in more than 1 of the 4 seasons. Most of Nevada normally receives less than 2 inches in each season, which is also true of extreme eastern California and the adjacent part of Arizona.

The seasonal shiftings of precipitation are shown in another way by maps 18 and 19. Map 18, of the excess of summer precipitation over winter precipitation, or vice versa, shows that most of Florida has a summer excess of more than 10 inches, while an area larger than Florida, extending from Lake Superior to Kansas normally has one of 8 inches or more. About three-fourths of the country has a summer excess, but the Pacific coast and part of the lower Mississippi Basin have a winter excess. The winter excess is small in the latter region but in part of the Pacific coast it exceeds 20 inches. The winter excess in the South is largely due to heavy rains on stalled fronts.

Map 19 shows that spring and autumn receive approximately equal amounts of precipitation in most of the country, but autumn is distinctly the wetter season in southern Florida, while spring is the wetter in the Lower Mississippi Valley. The autumn excess in Florida is partly due to the presence of more autumn than spring tropical cyclones, some of which yield totals large enough to affect the averages for even 40 years. The autumn excess near the Great Lakes and to the east thereof is partly due to the comparative warmness of the Lakes in autumn. This favors the development of convectional disturbances, including thunderstorms, and leads to an intensification of cyclonic disturbances. In spring, when the Lakes are relatively cold (and parts of their shores are still snow-covered) these sorts of precipitation are decreased. The somewhat lesser spring than autumn precipitation in most of the western third of the country is partly attributable to lower average spring temperature associated with winter snowfall, some of which remains (at least on the mountains) until the spring is well advanced. This interferes with convectional precipitation, which, although much of the rain is of the frontal type, has some comparative significance. (This influence is partly offset by the greater orographic precipitation on the cold mountain sides in spring than in autumn, under similar wind conditions.) Most of California has more spring than autumn precipitation. This is chiefly due to the relative frequence of cyclones with fronts but conceivably is influenced indirectly by seasonal contrasts in soil moisture. In spring the soil retains some of the abundant moisture received in winter. In autumn, by contrast, the soil has been rendered dry by the almost

rainless summer, with the result that condensation is interfered with.

The seasonal shifts indicated by maps 10–19 are closely related to changes in average temperatures and air pressure in the continental interior. In winter when the interior is relatively cold, not only are northwesterly winds common, but any northward moving air masses commonly encounter fronts, which they attempt to override, and are chilled relatively soon, and are compelled to drop their excess moisture in the South or middle East. In summer, conversely, the interior is relatively warm, inblowing winds are common except on the Pacific coast, and northward moving air masses are heated rather than cooled. The heavy summer rainfall close to the Gulf of Mexico and to the South Atlantic coast is largely due to stronger local convection, but in part reflects the significance of numerous tropical disturbances (few of which are hurricanes), many of which yield such heavy rainfalls within a few score miles of the ocean as to raise the average appreciably.[2]

The position of the eastern areas of relatively heavy precipitation also suggests a topographic influence. They are situated chiefly in three areas so far as elevation is concerned, (1) in the lowland between the southern Appalachians and the 1,000 feet contour at the west, (2) between the Gulf and the southern Appalachians, and (3) (as to the northern summer area) in the Ozarks and the more hilly parts of Iowa, the unglaciated part of Minnesota, and a morainic section of western Wisconsin. These latter areas favor thunderstorm development by inducing local turbulence, by lifting and by the heating of slopes.

The scanty summer rainfall in the Pacific States is partly due to the fact that the winds generally blow parallel to the coast, and the coast ranges interfere with the inward penetration of the moist air. Significant also is the fact that the land there is so much hotter than the Pacific Ocean in summer that any inblowing air has its relative humidity lowered and is able to retain its moisture. This retention helps prevent thunderstorms, the major cause of the summer rainfall of the East. Thunderstorms are also few in summer in the Pacific States because cyclonic disturbances are few then. They are few for two chief reasons; (1) the average course followed by mid-latitude lows in summer is across Canada, (2) far fewer tropical disturbances enter the Southwest than the Southeast.[3]

The contrasts between the rainfall totals received in relatively wet and relatively dry summers are shown in maps 20 and 21. The totals received are shown on map 20 by superimposed isohyets, while the spread between the totals received is shown on map 21. These maps show that in a relatively wet summer, New York receives about 18 inches, as does Iowa. In a dry summer, New York receives 6–8 inches and most of Iowa receives about 6 inches. Most of California receives about an inch on a wet summer, but none in a dry one. The spread between wet and dry summers (fig. 21) is more than 14 inches in parts of the Gulf and South Atlantic coast, is about 8 inches in most of the Northeast and Midwest and is less than 2 inches in much of the Southwest. Although the total received in a wet summer in the Southwest is distinctly small, it may interfere badly with the preparation of prunes, raisins and other dried fruit and may cause serious damage to some fruits which are not being dried, for example, by leading to the cracking of almost ripe cherries.

Map 21 shows, as does map 11, that the absolute range increases with the precipitation. The magnitude of the range is almost as great as the local average summer rainfall in most of the country. In a large southwestern region (especially California), the range is somewhat greater than the normal summer total.

In the eastern half of the country, there is a large southward increase in absolute vairability and a distinct southward increase in relative variability, just as for the year as a whole (fig. 12).

One of the interesting features of map 21 is that the variability is notably greater in the southwestern part of the Corn Belt (Missouri, eastern Kansas) than it is in the northern part (southern Minnesota). In both of these areas it is approximately as great as the average precipitation; thus it is relatively great. Somewhat west of this Corn Belt area, in the northern Great Plains, the normal range is somewhat less, only about three-fourths of the average precipitation. But, as in arid regions, occasionally in semiarid regions there is very little rainfall during a summer. This fact gives the northern Great Plains region a bad reputation, not to be overcome by the fact that in three-fourths of the years its range is somewhat less than in most of the country.

### THUNDERSTORMS AND HAIL

The frequency of thunderstorms is significant in explaining the differing amounts of summer rain and of hail. Comparison of maps 17 and 22 shows that, in general, the region where thunderstorms are relatively frequent have comparatively heavy summer rainfall, while most of the region which has few thunderstorms has light summer rainfall. The correspondence is less close than it would presumably be if summer rain were compared with summer thunderstorms instead of with all thunderstorms. For example, western Wisconsin, which has relatively heavy summer rainfall, has fewer thunderstorms according to map 22 than has southern Indiana, which has less rainfall. But many of southern Indiana's thunderstorms occur in spring and fall; during the summer, Wisconsin normally has several more thunderstorms than does southern Indiana.

Map 22 shows a Rocky Mountain region which has annually from 40 to 60 thunderstorms (nearly all of which occur in summer). That region, however, has little more recorded rain than the surrounding zone with fewer thunderstorms. This is partly because many Rocky Mountain thunderstorms yield little rain to the lowlands where most of the rain gages are located. The lightning of these mountain thunderstorms often set forest fires; they yield hail relatively often, but in that dry region hail is far less likely to disappear by melting in falling than is rain by evaporation.

Map 21 discloses that not far from the Pacific coast, 1 thunderstorm in 5 yields sufficient hail to cause damage; that in eastern Idaho 1 in 8 does, that in the central Great Plains, 1 in about 8 to 12 does; that in the western part of the Corn Belt, 1 in 10 to 15 does; in the eastern part of the Midwest, the ratio is 1 damaging hailstorm for 15 or 20 thunderstorms. In most of the Southeast, there is only 1 damaging hailstorm per 25 to 40 thunderstorms, while in Florida, with about 1 hailstorm a year and at least 70 thunderstorms, the ratio is less than a tenth that in most of California.

[2] Visher: Rainfalls of 10 Inches or More in 24 Hours in the United States, *Monthly Weather Rev.*, vol. 69, 1941, pp. 353-356; and Visher: Torrential Rains as a Serious Southern Handicap, *Geogr. Rev.* vol. 31, 1941, pp. 644-652.

[3] Visher: The Frequency of Tropical Cyclones, Especially Those of Minor Intensity, *Monthly Weather Rev.*, 58 (1930): 62-64. Effects of Tropical Cyclones upon the Weather of Mid-latitudes, *Geogr. Rev.* vol. 15, 1925, pp. 106-114.

The eastward decrease in hailstorms as compared with thunderstorms reflects two chief influences, elevation and storm intensity. Most of the areas where hailstorms are relatively frequent are situated at altitudes of 4,000 to 7,000 feet above sea level, therefore much nearer the freezing atmospheric level. The Southeast, however, is near sea level, and doubtless much hail melts before reaching the ground. Note that near the mouth of the Colorado River, a western area near sea level, the ratio of hail to thunderstorms is 1 to more than 20, or far smaller than in most of the West, with its greater elevations. More hailstorms occur in the West than in the East also partly because western thunderstorms are on the average more violent, although they are briefer and yield less rain. Some eastern thunderstorms are as violent as any in the West, but most of them are not violent, partly because, as a result of the abundant moisture in the air, thunderstorms which are only moderately intense often can develop. Hence of 40 or 50 eastern thunderstorms a year, three-fourths may be of only moderate intensity. In much of the West, however, summer conditions are usually so unfavorable for condensation that the cloud base is relatively high, so that convection must be stronger, reach higher, than in the humid East to cause a thunderstorm. In other words, only relatively intense convectional disturbances can cause enough condensation in the dry West to liberate enough energy to create thunderstorms (by the splitting and fall of the raindrops). Such intense disturbances are the type which yield hail.[4]

[4] Helpful suggestions were received concerning a preliminary manuscript edition from Charles F. Brooks, John K. Rose, and Robert G. Stone.

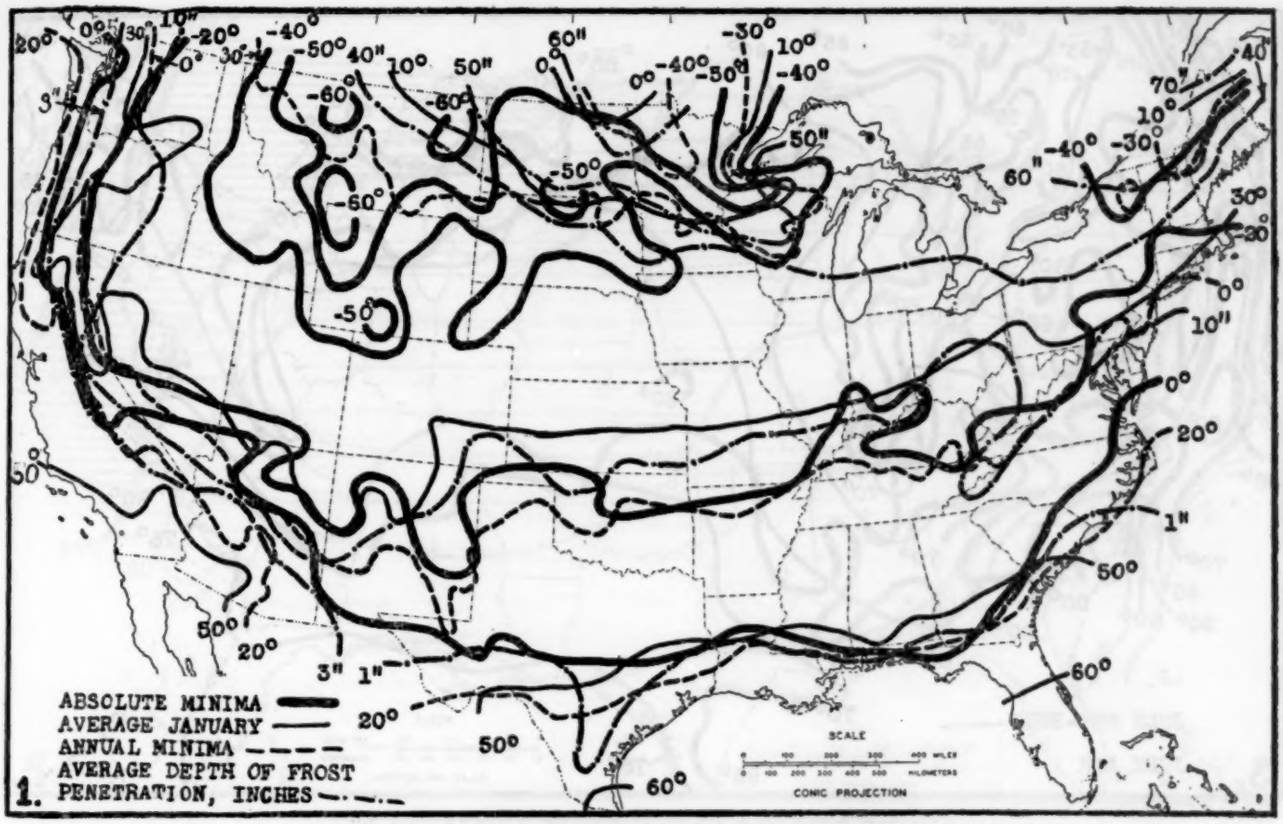



FIGURE 1.—Superimposed isotherms of average January temperatures, average minima and of extreme minima (° F.); also average depth of frost penetration (inches).

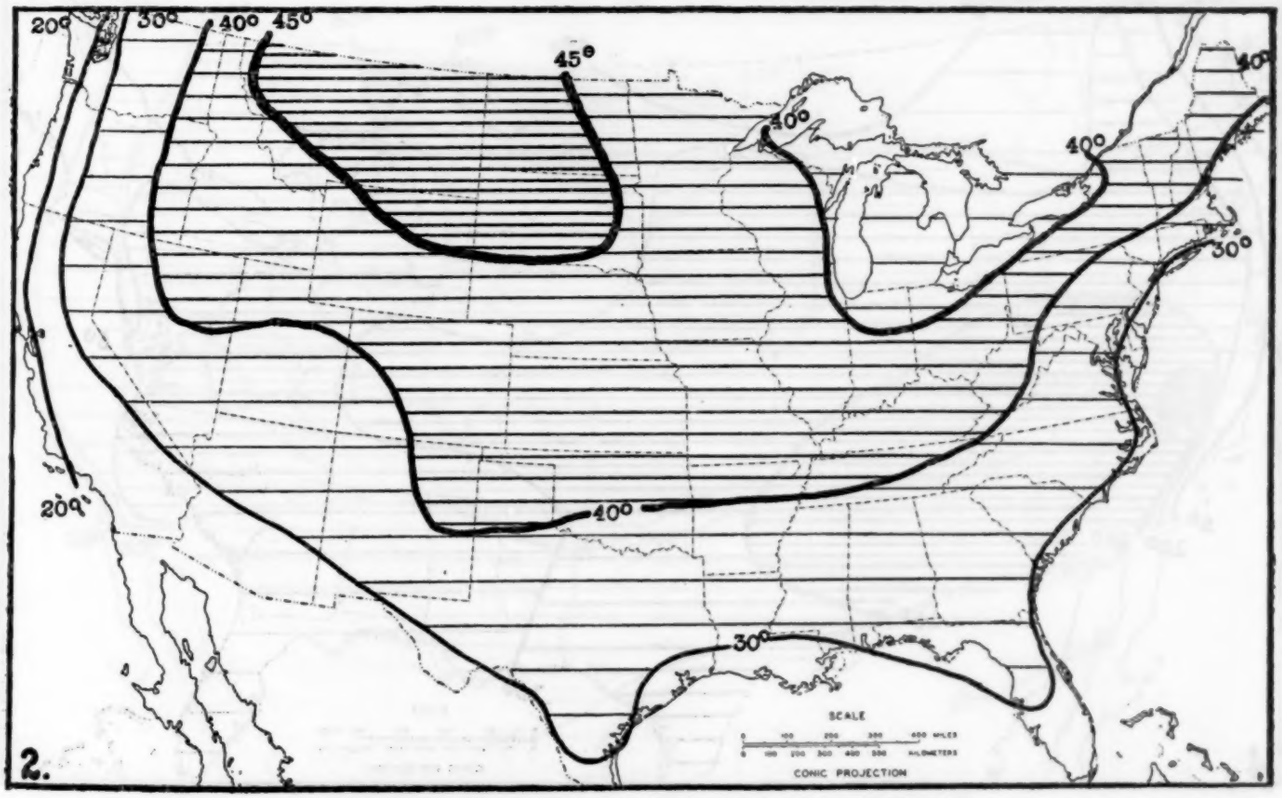



FIGURE 2.—Difference between mean January temperature and mean annual minima (° F.).

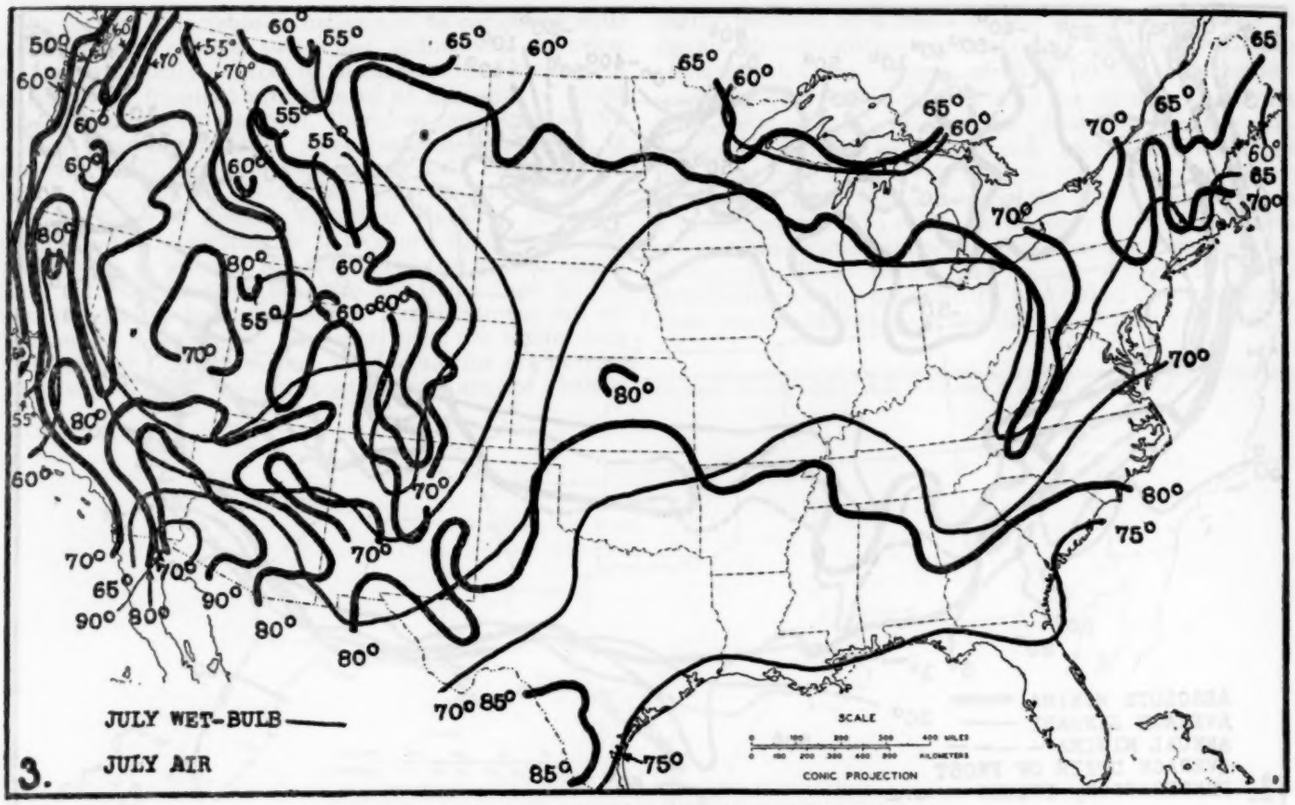



FIGURE 3.—Average July air and wet-bulb temperatures, selected isolines (° F.).

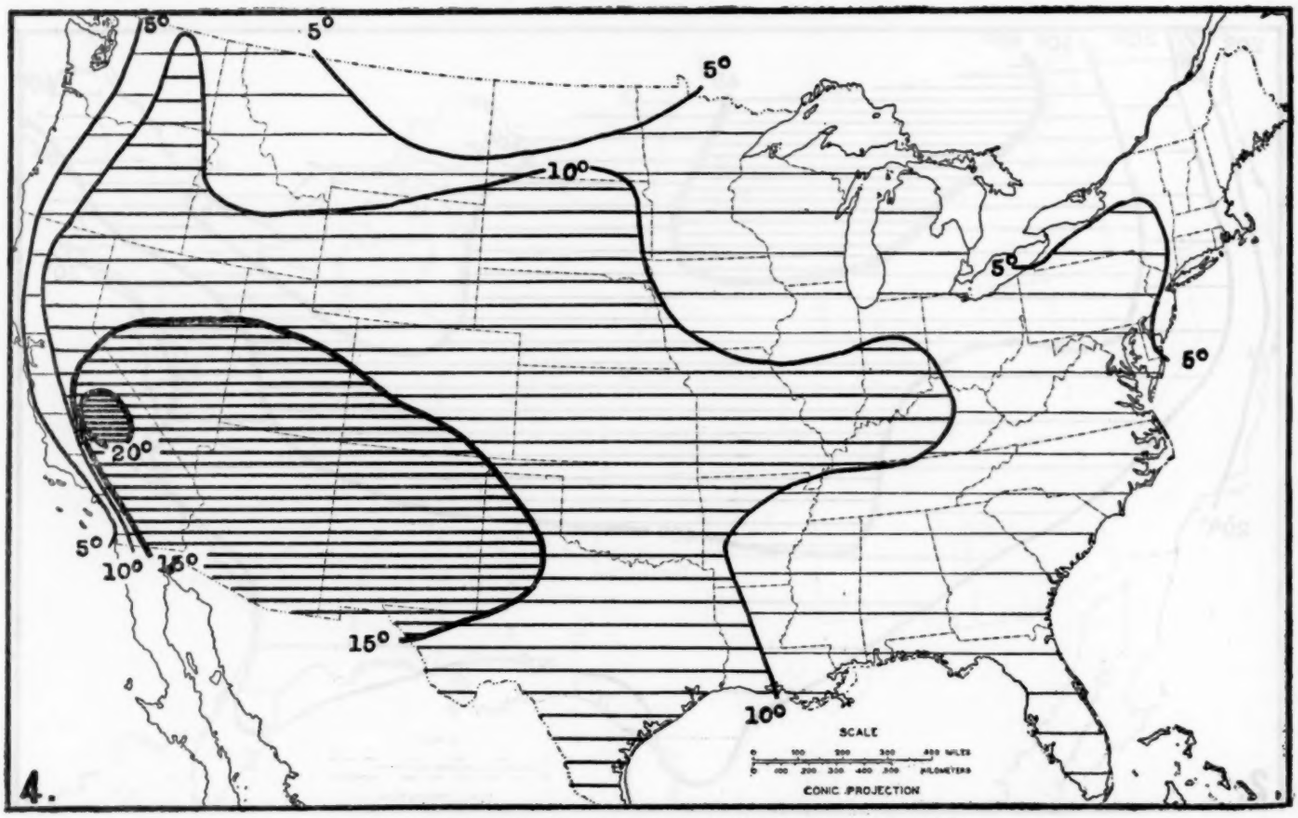



FIGURE 4.—Average differences between mean July air and wet-bulb temperatures (° F.).

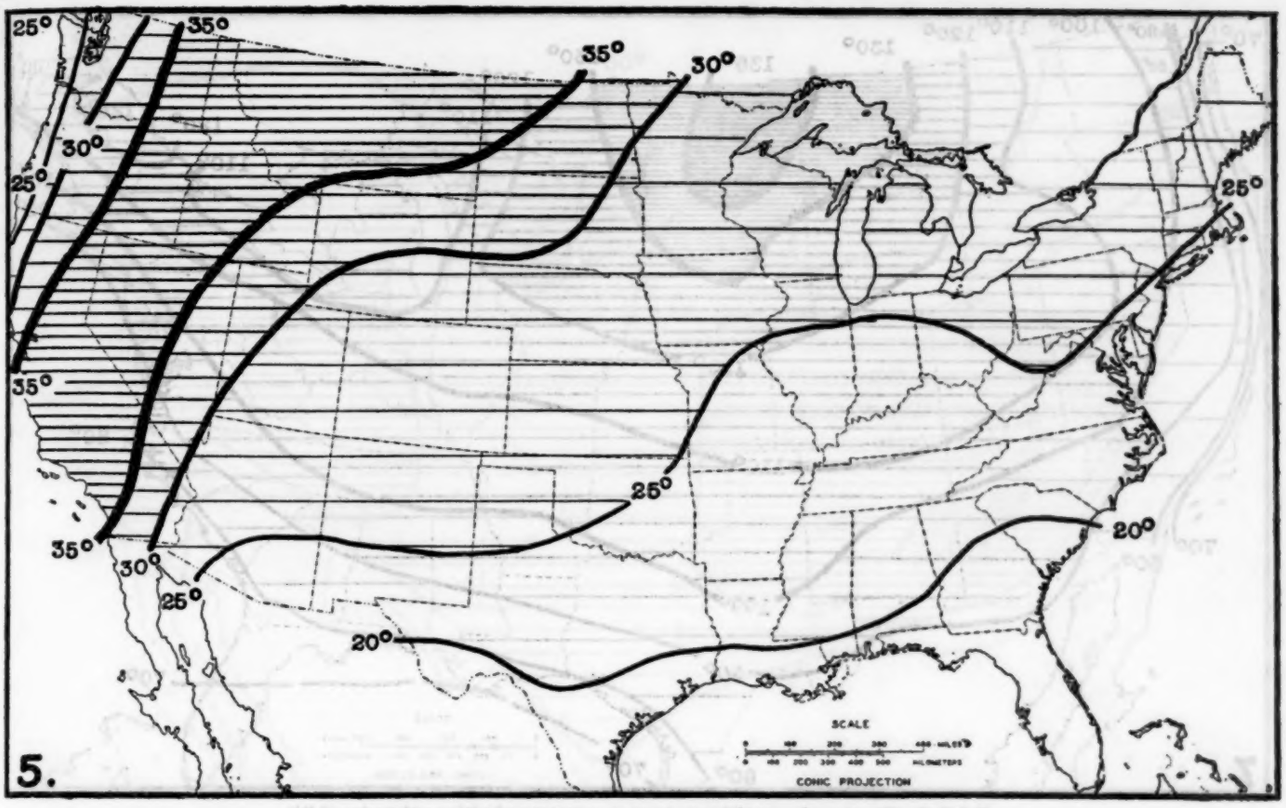



FIGURE 5.—Difference between July average temperature and mean annual maxima (° F.).

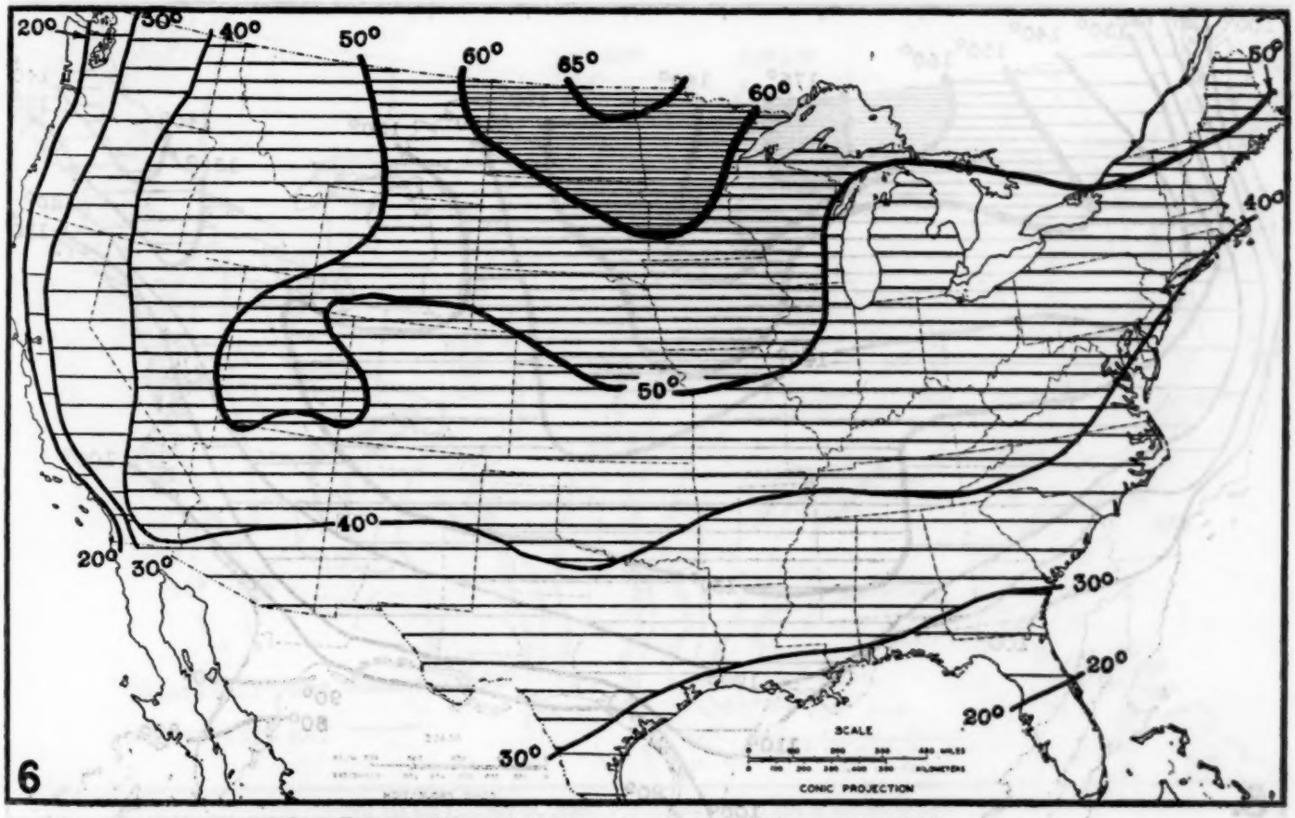



FIGURE 6.—Difference between mean January and mean July temperatures (° F.).

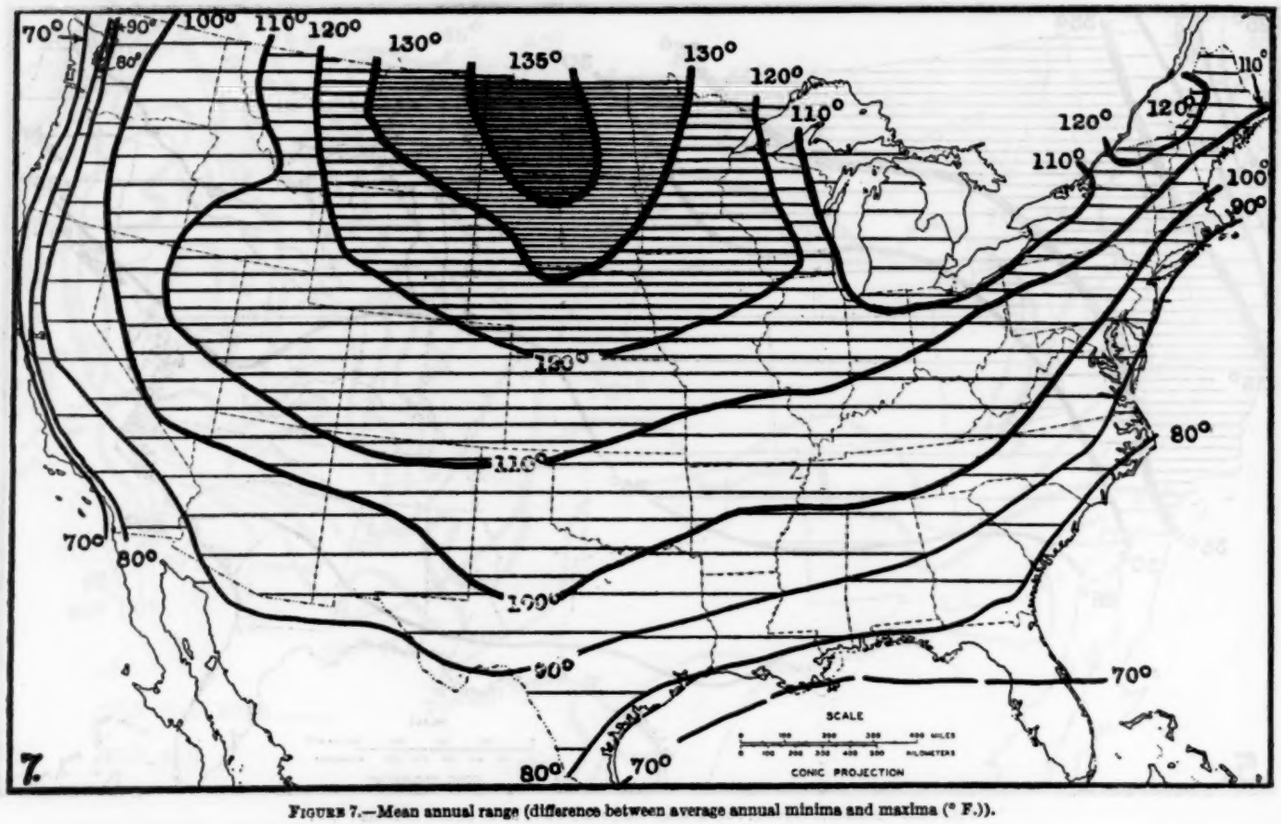



FIGURE 7.—Mean annual range (difference between average annual minima and maxima (° F.)).

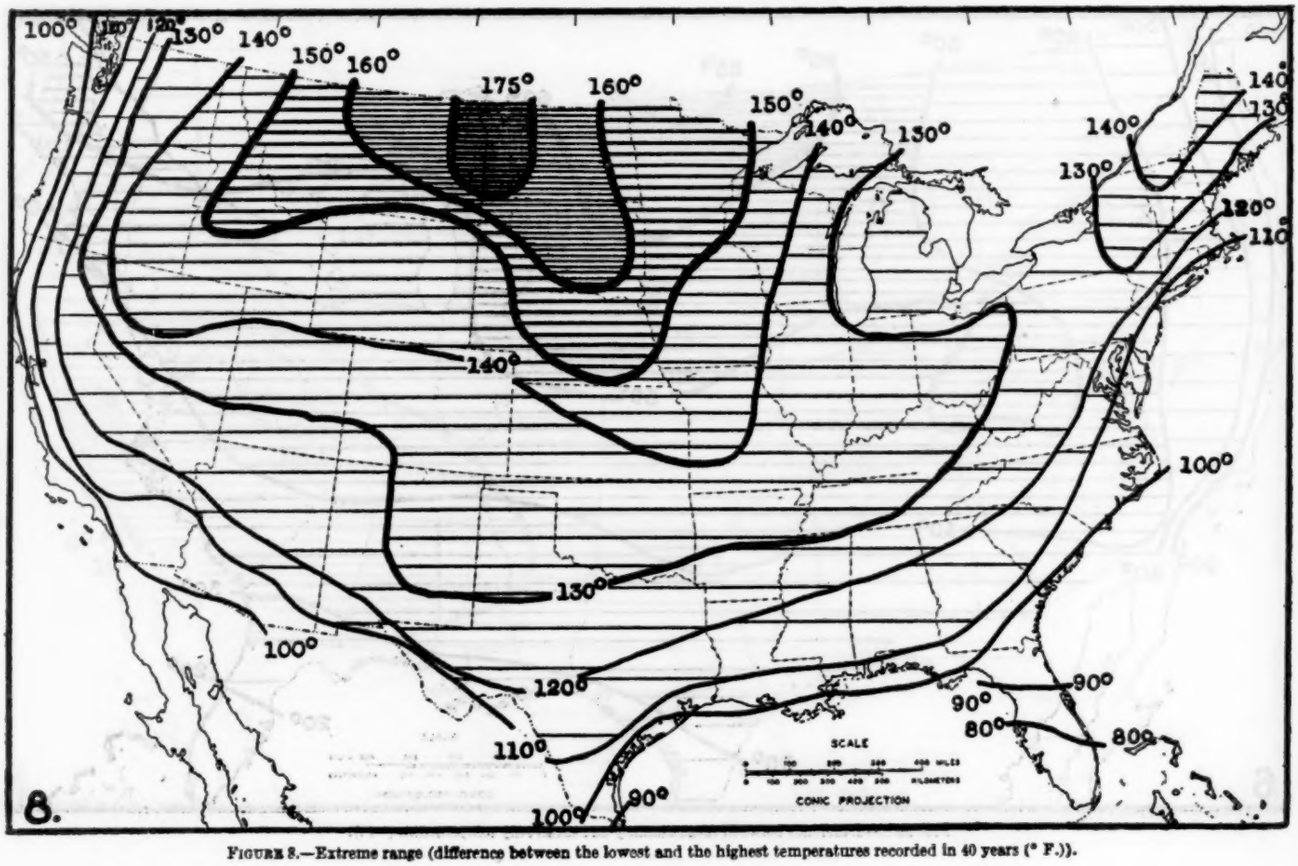



FIGURE 8.—Extreme range (difference between the lowest and the highest temperatures recorded in 40 years (° F.)).

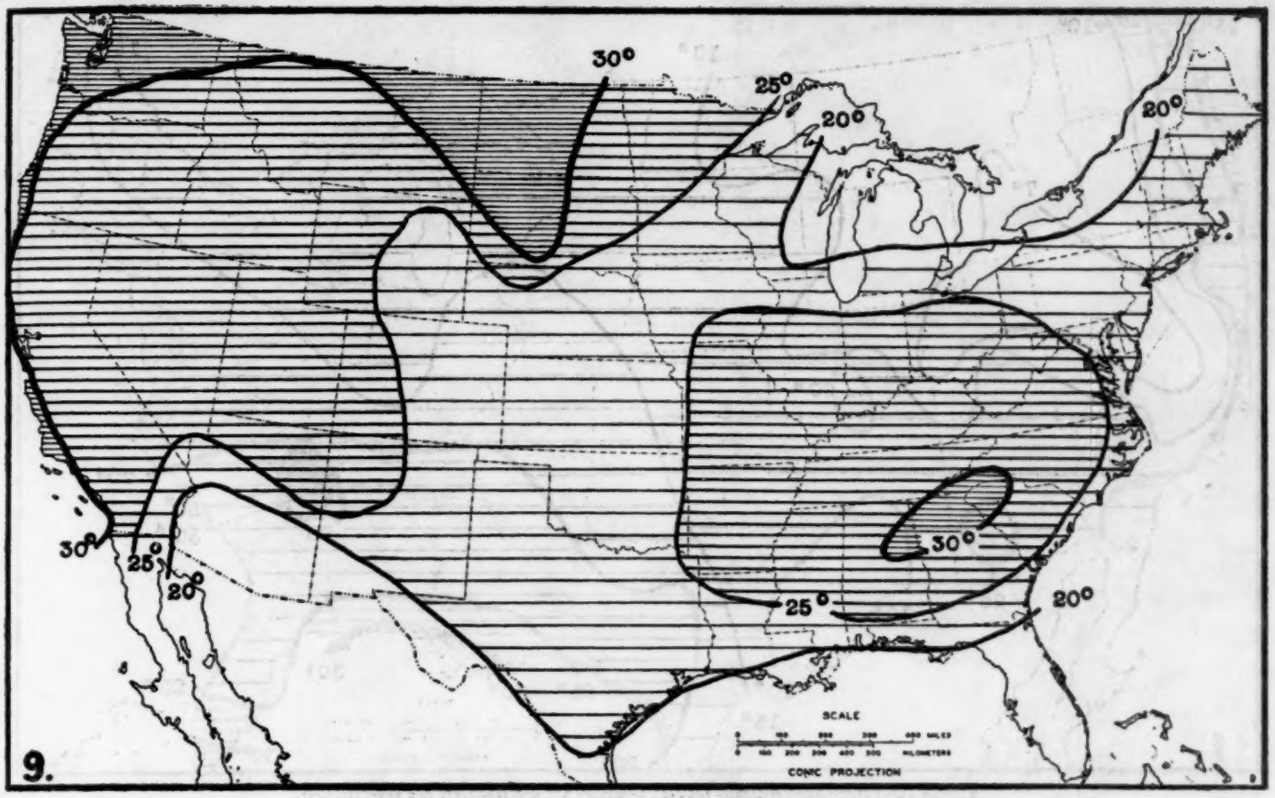



FIGURE 9.—Spread between annual or normal temperature range and extreme range (° F.).

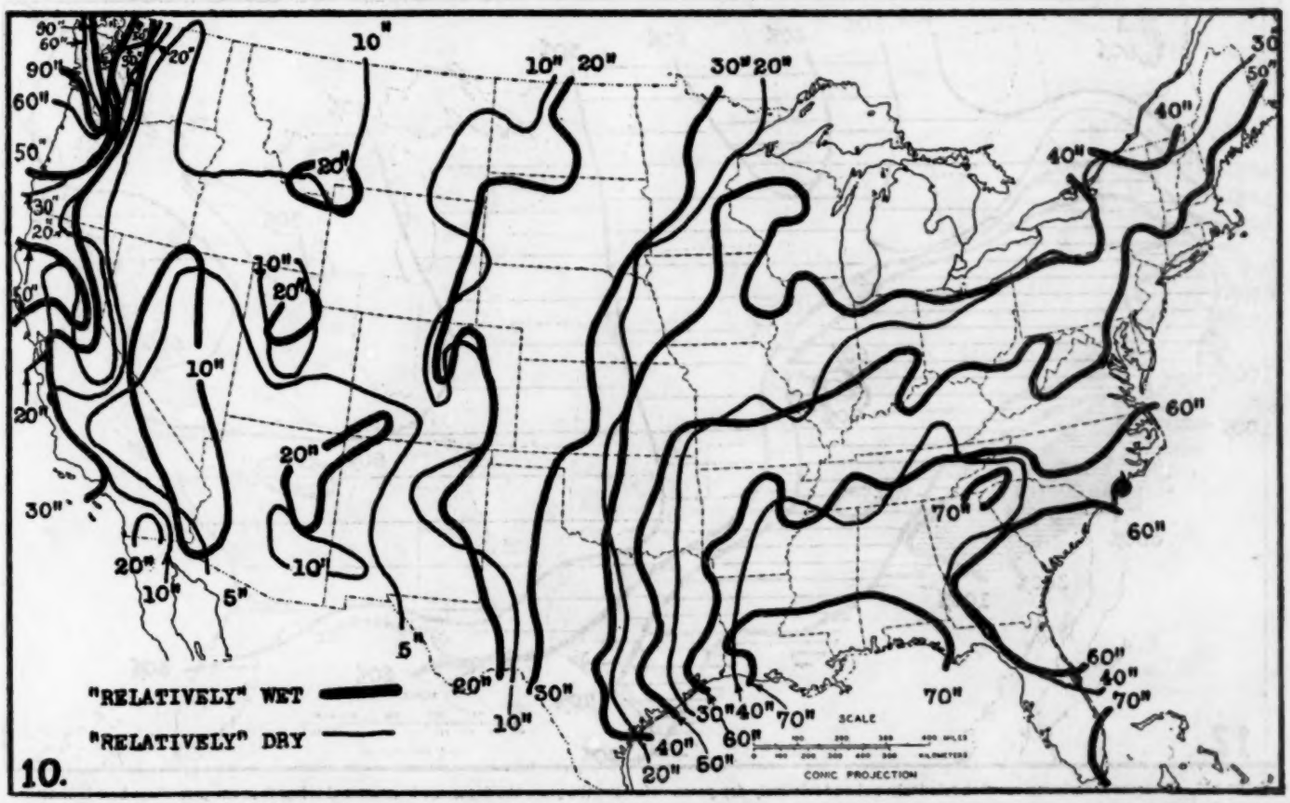



FIGURE 10.—Superimposed isohyets for relatively wet and relatively dry years. ("Relatively wet" as used in this article means only one-eighth are wetter; "relatively dry" that only one-eighth are drier).

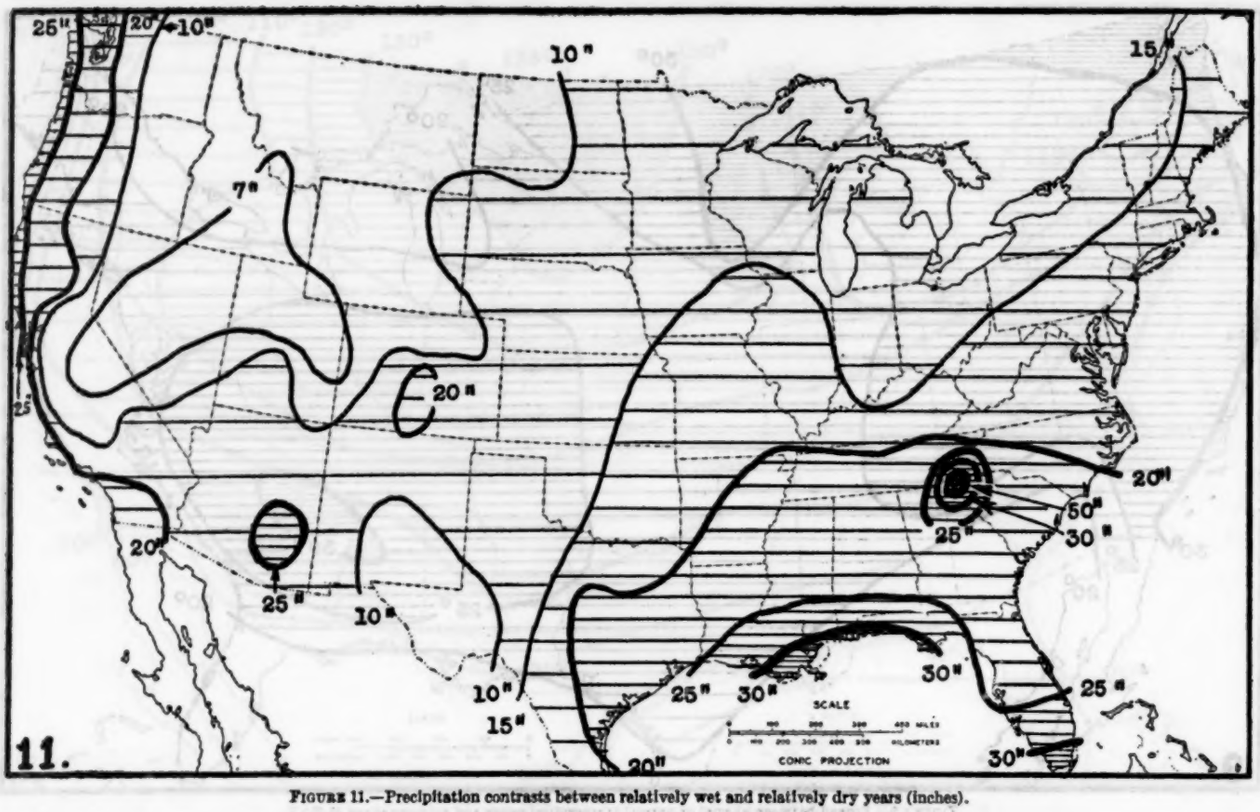



FIGURE 11.—Precipitation contrasts between relatively wet and relatively dry years (inches).

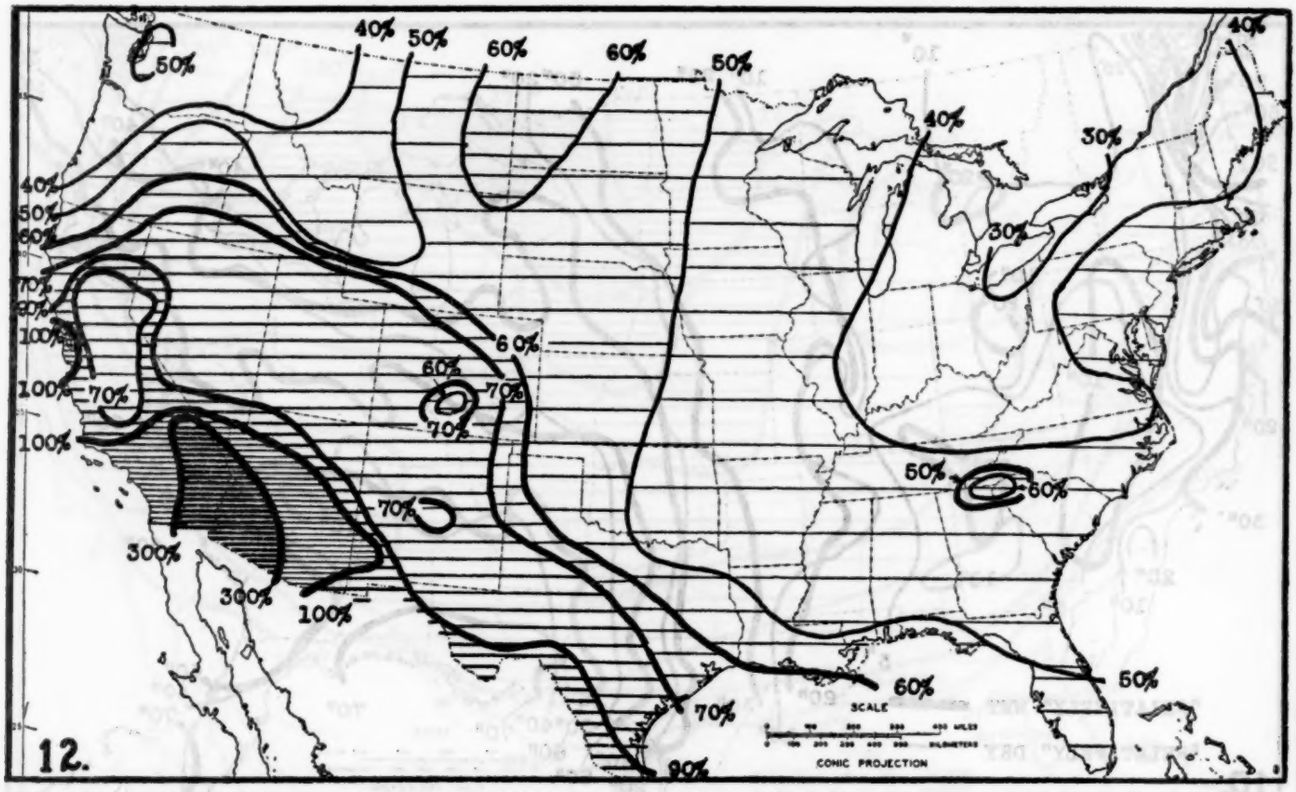



FIGURE 12.—Percentage variation between relatively wet and relatively dry years. (In ¾ of the years the departure from normal is less than the percentage here indicated).

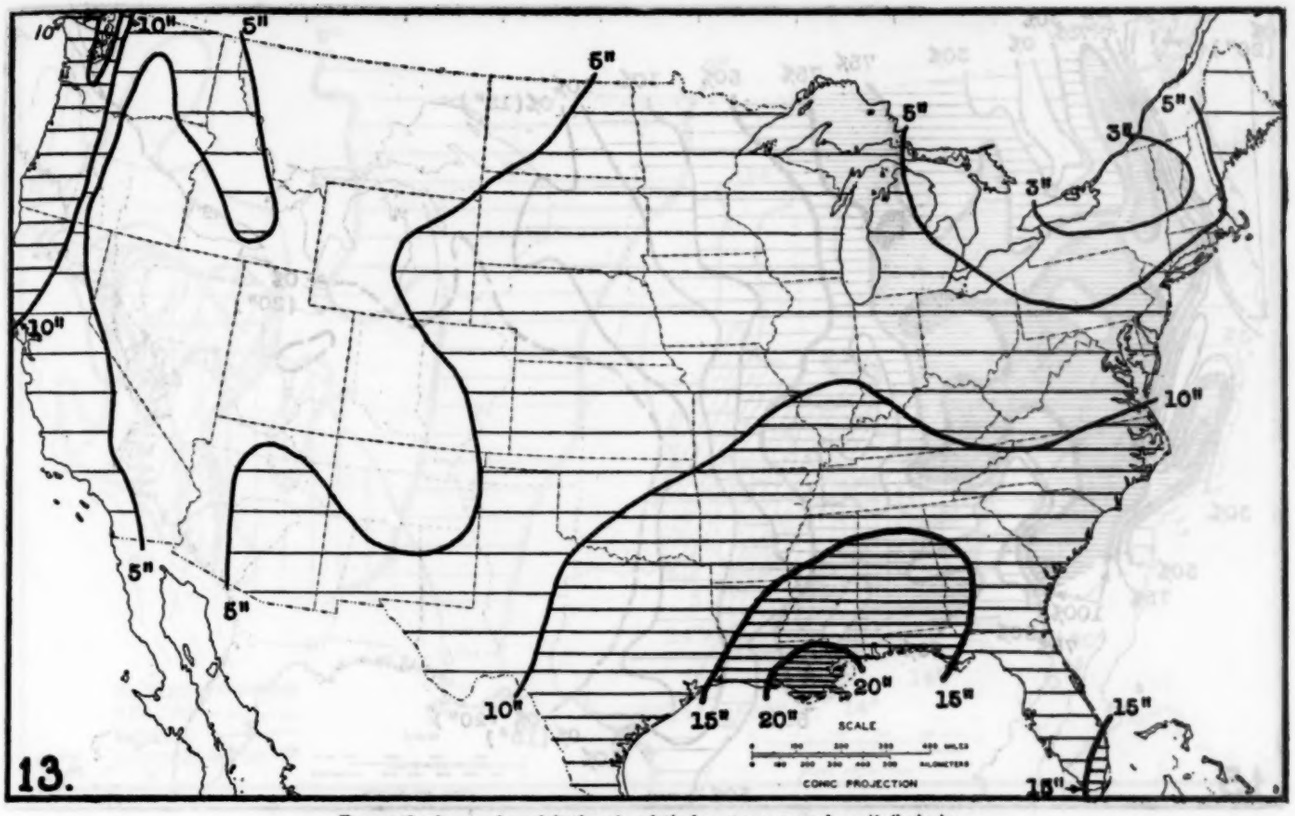



FIGURE 13.—Increased precipitation of a relatively wet over normal month (inches).

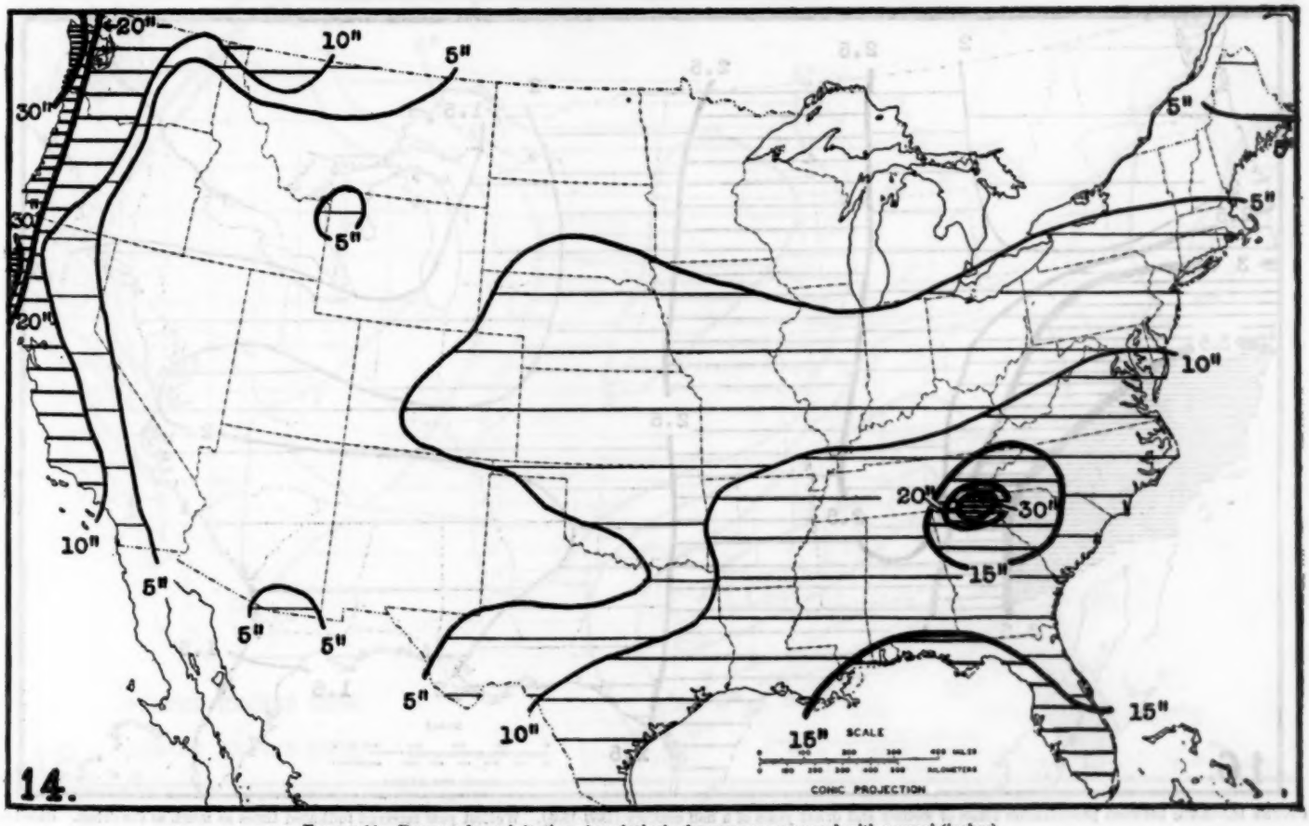



FIGURE 14.—Decreased precipitation of a relatively dry year as compared with normal (inches).

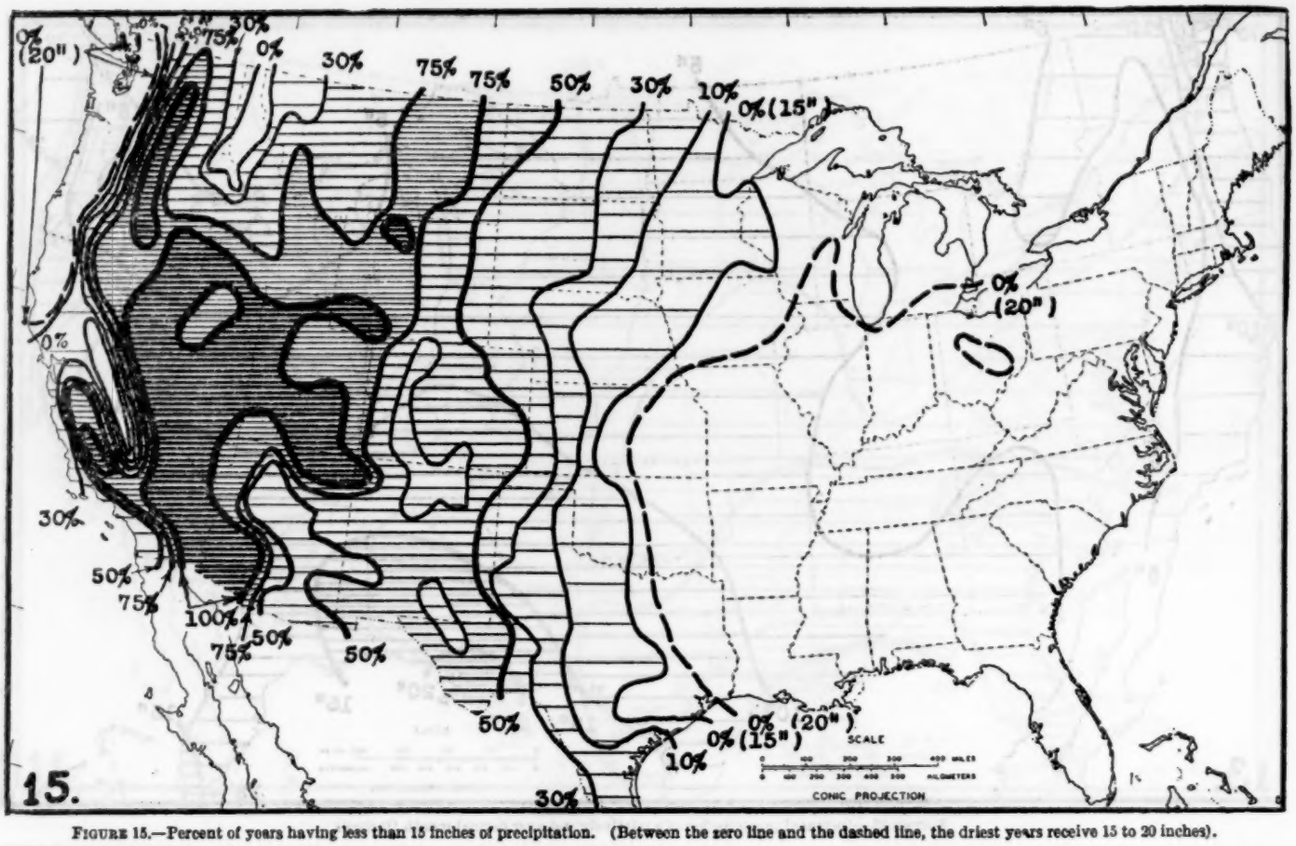



FIGURE 15.—Percent of years having less than 15 inches of precipitation. (Between the zero line and the dashed line, the driest years receive 15 to 20 inches).

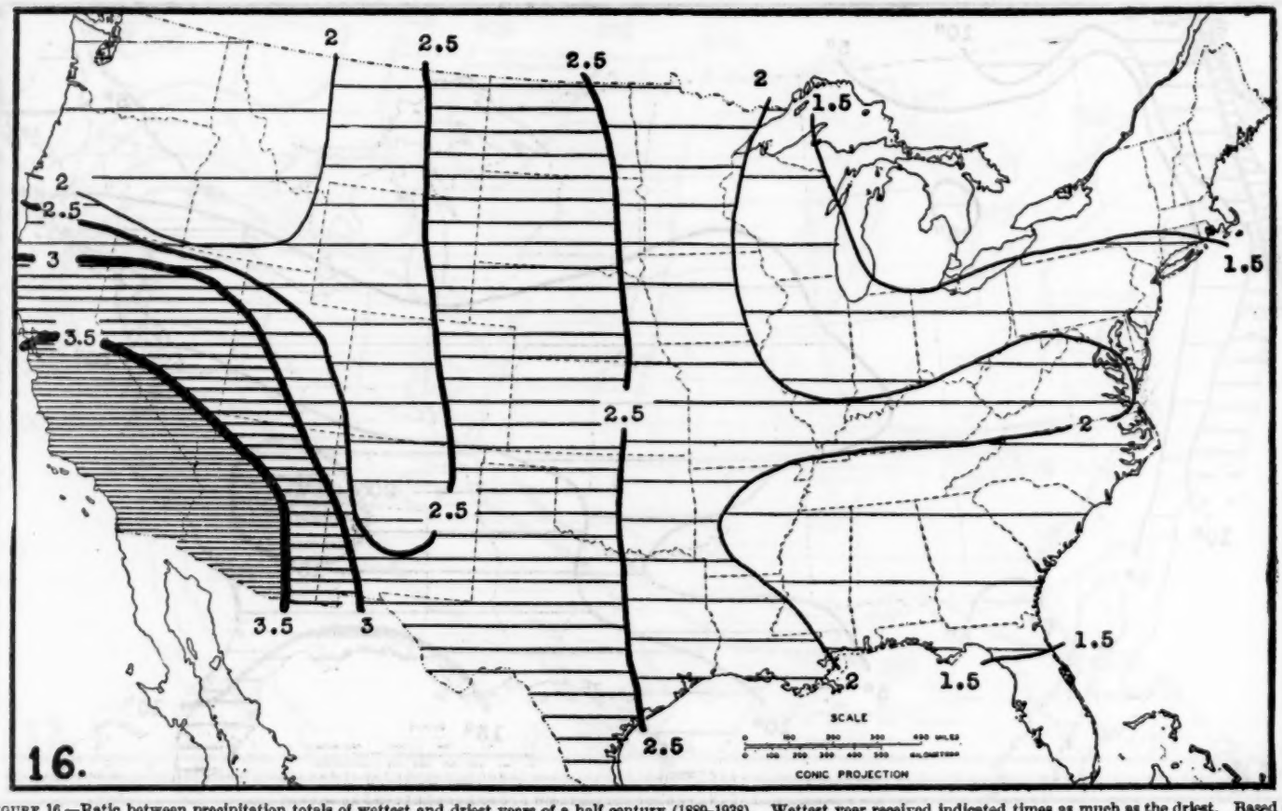



FIGURE 16.—Ratio between precipitation totals of wettest and driest years of a half century (1889-1938). Wettest year received indicated times as much as the driest. Based on State averages.

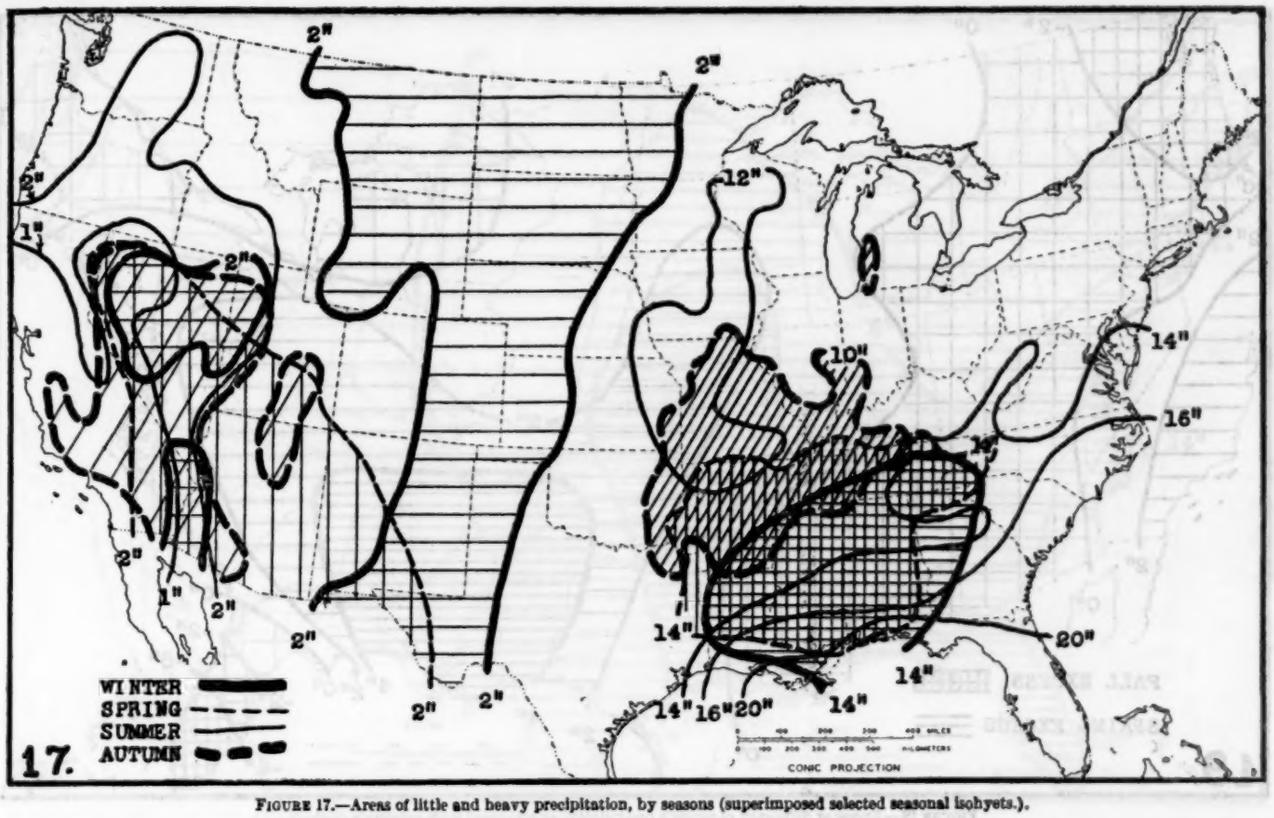



FIGURE 17.—Areas of little and heavy precipitation, by seasons (superimposed selected seasonal isohyets.).

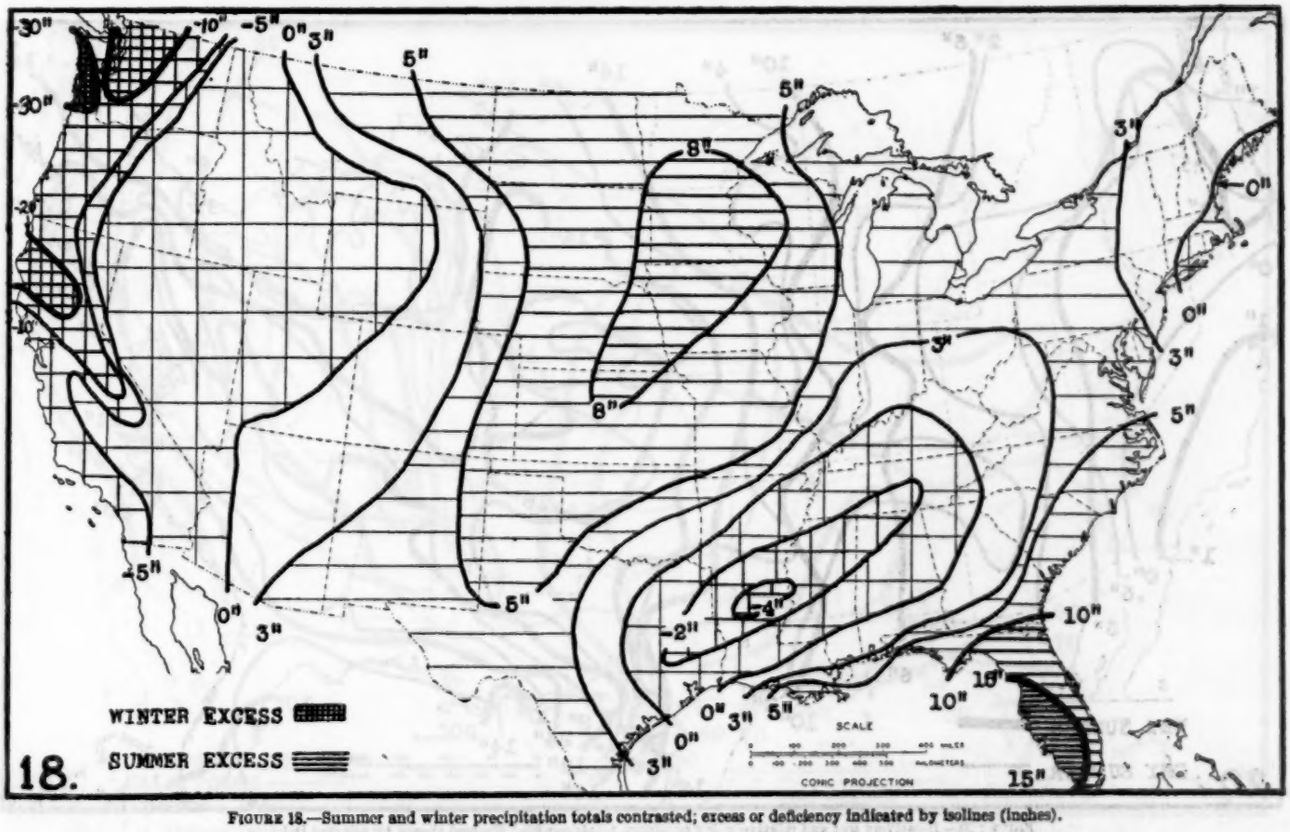



FIGURE 18.—Summer and winter precipitation totals contrasted; excess or deficiency indicated by isolines (inches).

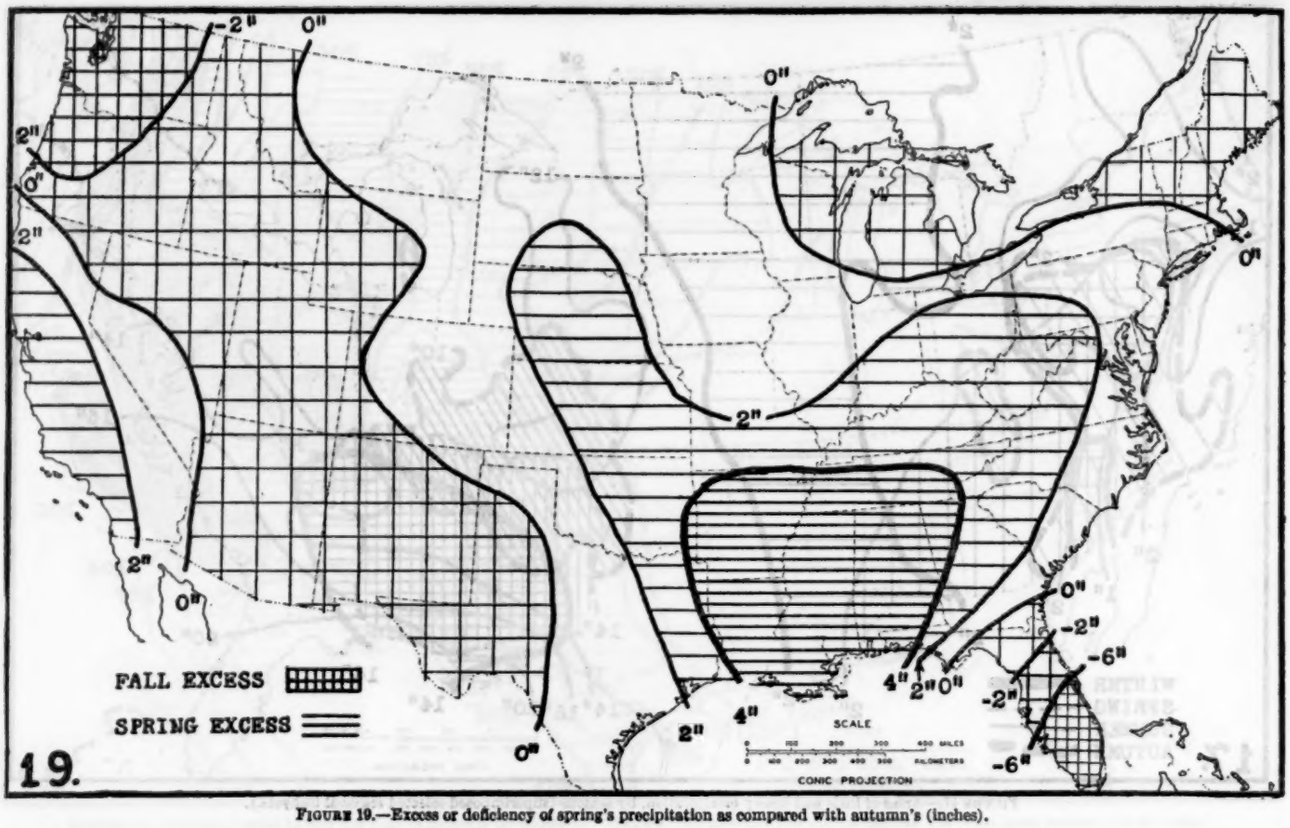



FIGURE 19.—Excess or deficiency of spring's precipitation as compared with autumn's (inches).

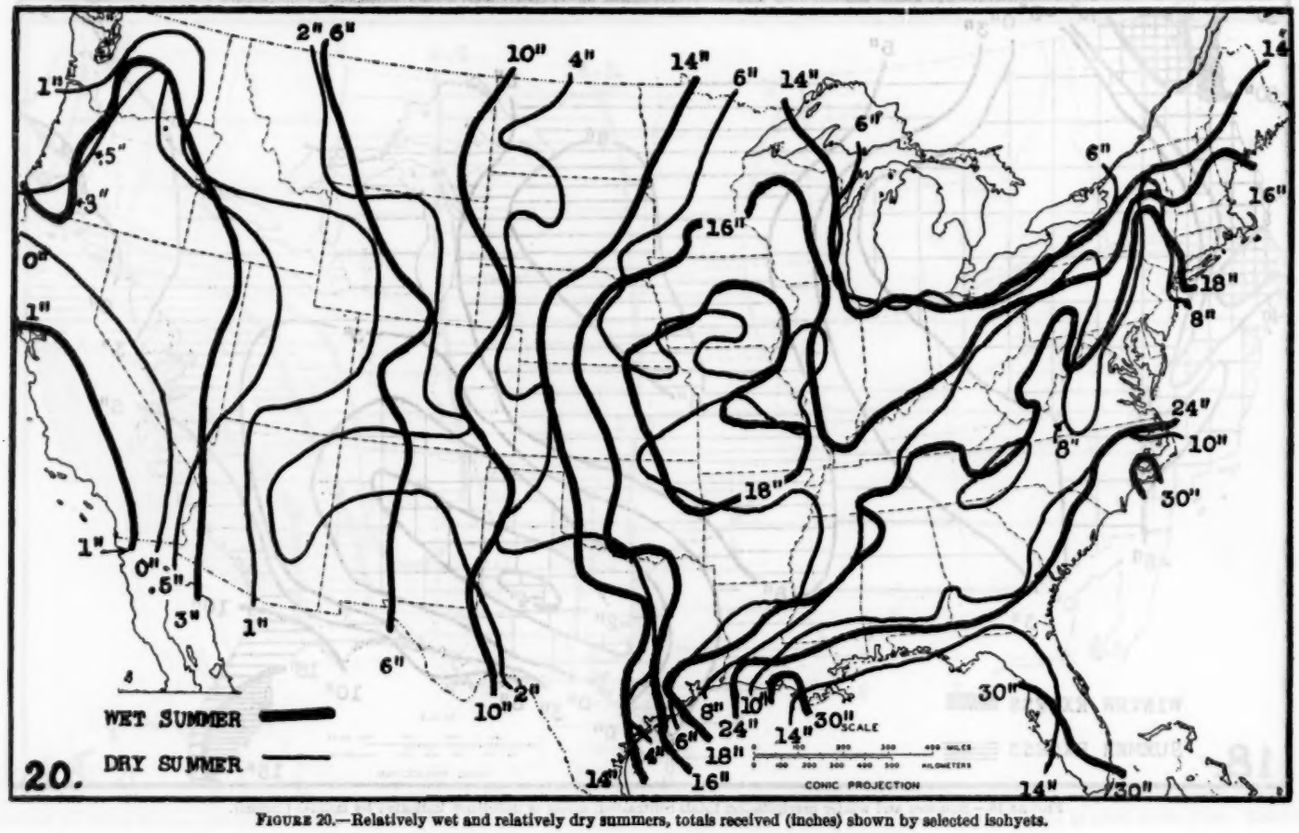



FIGURE 20.—Relatively wet and relatively dry summers, totals received (inches) shown by selected isohyets.

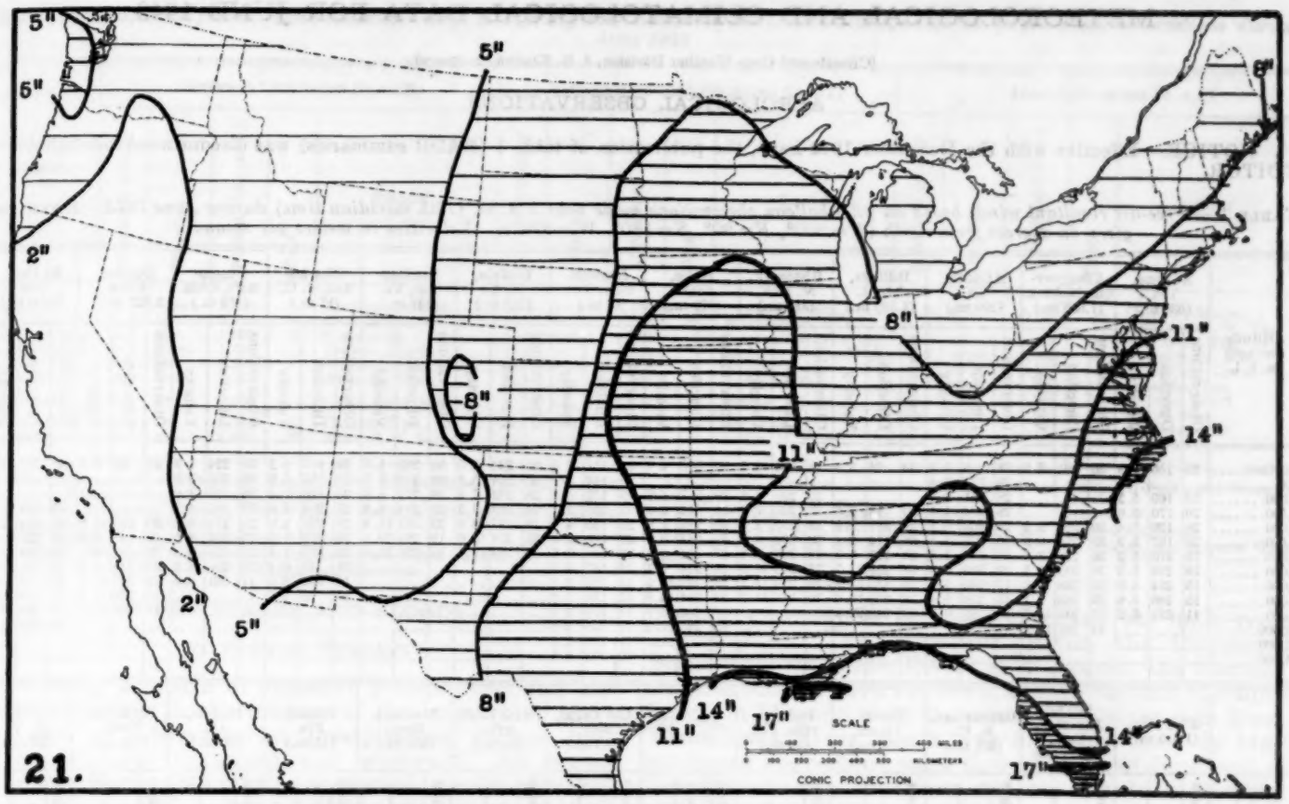



FIGURE 21.—Summer precipitation spread between relatively wet and relatively dry seasons (inches).

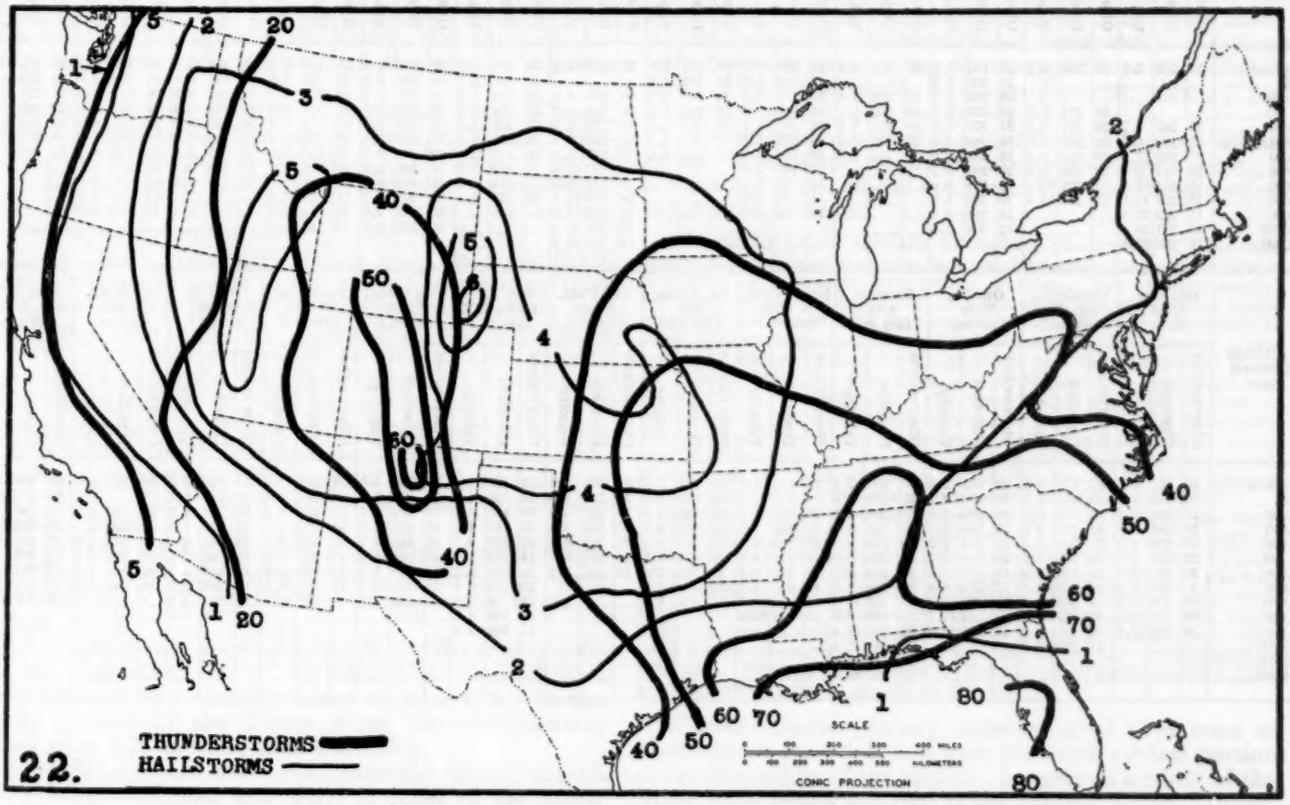



FIGURE 22.—Superimposed isolines showing the annual average number of thunderstorm days and of damaging hailstorms.

543645—43——2

# METEOROLOGICAL AND CLIMATOLOGICAL DATA FOR JUNE 1943

[Climate and Crop Weather Division, J. B. KINCER, in charge]

## AEROLOGICAL OBSERVATIONS

NOTICE.—Effective with the December 1942 issue, the publication of table 1 (RAOB summaries) was discontinued indefinitely.—EDITOR.

TABLE 2.—*Free-air resultant winds based on pilot-balloon observations made near 5 p. m. (75th meridian time) during June 1943. Directions given in degrees from north (N=360°, E=90°, S=180°, W=270°). Velocities in meters per second*

| Altitude (meters) m. s. l. | Abilene, Tex. (538 m.) | | | Albuquerque, N. Mex. (1,630 m.) | | | Atlanta, Ga. (299 m.) | | | Billings, Mont. (1,095 m.) | | | Bismarck, N. Dak. (512 m.) | | | Boise, Idaho (870 m.) | | | Brownsville, Tex. (7 m.) | | | Buffalo, N. Y. (220 m.) | | | Burlington, Vt. (132 m.) | | | Charleston, S. C. (17 m.) | | | Cincinnati, Ohio (152 m.) | | | Denver, Colo. 1,627 m.) | | | El Paso, Tex. (1,196 m.) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity |
| Surface | 30 | 156 | 3.9 | 30 | 191 | 2.2 | 28 | 8 | 0.4 | 30 | 24 | 2.4 | 29 | 264 | 0.5 | 30 | 316 | 4.4 | 30 | 132 | 7.7 | 30 | 234 | 3.5 | 30 | 283 | 1.8 | 29 | 165 | 2.2 | 30 | 224 | 1.3 | 30 | 94 | 0.8 | 30 | 231 | 2.2 |
| 500 | | | | | | | 28 | 347 | 0.4 | | | | | | | | | | 30 | 143 | 8.7 | 30 | 254 | 6.3 | 30 | 272 | 3.7 | 29 | 185 | 5.3 | 30 | 263 | 2.9 | | | | | | |
| 1,000 | 30 | 169 | 5.2 | | | | 28 | 241 | 0.4 | | | | 29 | 229 | 0.8 | 30 | 317 | 4.2 | 25 | 152 | 6.3 | 28 | 253 | 7.8 | 28 | 277 | 6.4 | 28 | 198 | 3.4 | 30 | 265 | 3.9 | | | | | | |
| 1,500 | 29 | 170 | 5.6 | | | | 28 | 284 | 1.3 | 30 | 15 | 2.6 | 27 | 228 | 1.4 | 30 | 314 | 3.3 | 23 | 154 | 5.0 | 26 | 260 | 8.3 | 25 | 284 | 8.8 | 27 | 218 | 2.0 | 29 | 265 | 4.7 | | | | 30 | 218 | 2.0 |
| 2,000 | 28 | 179 | 5.4 | 30 | 220 | 3.2 | 27 | 304 | 0.8 | 29 | 317 | 0.3 | 23 | 250 | 2.5 | 30 | 283 | 1.8 | 22 | 139 | 4.3 | 24 | 267 | 9.9 | 22 | 287 | 11.8 | 24 | 280 | 2.0 | 26 | 272 | 4.4 | 30 | 115 | 1.0 | 30 | 224 | 2.4 |
| 2,500 | 23 | 197 | 5.2 | 30 | 214 | 3.5 | 25 | 278 | 1.8 | 26 | 214 | 2.4 | 20 | 252 | 5.6 | 29 | 244 | 2.4 | 22 | 139 | 3.7 | 23 | 274 | 10.0 | 19 | 291 | 14.2 | 23 | 313 | 1.4 | 25 | 275 | 4.8 | 30 | 147 | 0.9 | 30 | 227 | 2.9 |
| 3,000 | 19 | 210 | 5.2 | 30 | 220 | 3.4 | 24 | 256 | 1.5 | 22 | 227 | 6.3 | 19 | 255 | 8.4 | 27 | 224 | 4.0 | 19 | 148 | 3.6 | 19 | 284 | 11.5 | 18 | 298 | 15.4 | 23 | 338 | 1.5 | 23 | 274 | 4.9 | 30 | 200 | 2.1 | 30 | 232 | 2.8 |
| 4,000 | 19 | 238 | 5.2 | 26 | 243 | 5.5 | 22 | 253 | 1.6 | 18 | 239 | 11.7 | 13 | 253 | 13.5 | 24 | 228 | 7.3 | 18 | 147 | 3.4 | | | | | | | 21 | 40 | 0.4 | 16 | 286 | 5.2 | 25 | 236 | 7.2 | 28 | 224 | 3.7 |
| 5,000 | 15 | 234 | 5.0 | 25 | 248 | 8.6 | 17 | 245 | 2.1 | 16 | 240 | 13.7 | 10 | 250 | 14.7 | 24 | 222 | 10.9 | 15 | 165 | 2.5 | | | | | | | 18 | 334 | 2.0 | 11 | 281 | 4.6 | 22 | 242 | 13.0 | 26 | 231 | 5.5 |
| 6,000 | 15 | 226 | 5.6 | 23 | 243 | 9.1 | 13 | 256 | 3.4 | 14 | 252 | 16.4 | 10 | 256 | 16.2 | 22 | 224 | 13.8 | 15 | 158 | 3.2 | | | | | | | 15 | 23 | 2.0 | | | | 16 | 250 | 14.5 | 19 | 235 | 6.9 |
| 8,000 | 11 | 231 | 6.2 | 17 | 249 | 14.5 | 10 | 211 | 6.2 | 10 | 246 | 22.8 | | | | 17 | 232 | 18.8 | 15 | 174 | 2.9 | | | | | | | | | | | | | 11 | 260 | 20.0 | 19 | 254 | 7.6 |
| 10,000 | | | | 13 | 247 | 19.3 | | | | | | | | | | 13 | 243 | 21.2 | 12 | 115 | 3.6 | | | | | | | | | | | | | | | | 10 | 241 | 12.3 |
| 12,000 | | | | | | | | | | | | | | | | | | | 11 | 110 | 2.2 | | | | | | | | | | | | | | | | | |
| 14,000 | | | | | | | | | | | | | | | | | | | 10 | 102 | 5.1 | | | | | | | | | | | | | | | | | |

| Altitude (meters) M. s. l. | Ely, Nev. (1,910 m.) | | | Grand Junction, Colo. (1,413 m.) | | | Greensboro, N. C. (271 m.) | | | Havre, Mont. (767 m.) | | | Jacksonville, Fla. (16 m.) | | | Joliet, Ill. (178 m) | | | Las Vegas, Nev. (573 m.) | | | Little Rock, Ark. (88 m.) | | | Medford, Oreg. (410 m.) | | | Miami, Fla. (15 m.) | | | Mobile, Ala. (66 m.) | | | Nashville, Tenn. (194 m.) | | | New York, N. Y. (15 m.) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity |
| Surface | 29 | 210 | 5.4 | 29 | 268 | 1.2 | 27 | 194 | 1.6 | 27 | 256 | 0.4 | 29 | 126 | 3.8 | 29 | 227 | 2.7 | 30 | 210 | 4.2 | 30 | 191 | 1.5 | 30 | 317 | 1.6 | 29 | 115 | 4.0 | 30 | 169 | 2.4 | 30 | 307 | 1.2 | 29 | 229 | 3.2 |
| 500 | | | | | | | 27 | 206 | 2.3 | | | | 29 | 142 | 4.6 | 29 | 232 | 4.0 | | | | 30 | 196 | 2.7 | 30 | 318 | 2.0 | 29 | 123 | 5.6 | 30 | 181 | 4.1 | 30 | 298 | 2.7 | 29 | 252 | 4.5 |
| 1,000 | | | | | | | 26 | 225 | 2.7 | 27 | 270 | 1.4 | 28 | 176 | 3.0 | 29 | 236 | 5.2 | 30 | 206 | 5.8 | 30 | 209 | 2.6 | 30 | 317 | 2.2 | 29 | 116 | 4.6 | 27 | 197 | 2.8 | 30 | 285 | 3.0 | 27 | 273 | 6.2 |
| 1,500 | | | | | | | 26 | 225 | 2.5 | 26 | 230 | 1.7 | 26 | 190 | 1.9 | 26 | 240 | 5.6 | 30 | 214 | 6.2 | 29 | 218 | 3.0 | 29 | 301 | 2.5 | 29 | 101 | 3.6 | 25 | 167 | 0.3 | 30 | 261 | 3.0 | 26 | 286 | 7.2 |
| 2,000 | 29 | 207 | 7.2 | 29 | 261 | 3.1 | 24 | 271 | 3.5 | 24 | 233 | 4.0 | 26 | 187 | 1.6 | 21 | 252 | 6.6 | 30 | 220 | 6.2 | 27 | 228 | 3.3 | 26 | 277 | 2.4 | 27 | 92 | 3.2 | 24 | 122 | 0.2 | 28 | 250 | 4.9 | 21 | 294 | 8.7 |
| 2,500 | 29 | 199 | 6.7 | 29 | 230 | 4.1 | 24 | 288 | 4.8 | 21 | 249 | 6.4 | 25 | 172 | 1.5 | 17 | 264 | 6.5 | 30 | 215 | 6.5 | 24 | 238 | 3.6 | 24 | 247 | 2.5 | 25 | 101 | 3.0 | 21 | 82 | 1.0 | 26 | 250 | 5.9 | 19 | 294 | 10.4 |
| 3,000 | 27 | 209 | 7.3 | 28 | 227 | 6.0 | 23 | 286 | 4.9 | 17 | 245 | 8.3 | 24 | 134 | 0.8 | 15 | 268 | 7.6 | 30 | 217 | 8.1 | 23 | 245 | 3.6 | 22 | 231 | 2.9 | 23 | 115 | 3.0 | 19 | 82 | 1.8 | 26 | 250 | 6.1 | 16 | 292 | 10.6 |
| 4,000 | 23 | 217 | 6.7 | 23 | 224 | 9.0 | 21 | 291 | 5.2 | | | | 22 | 101 | 1.9 | | | | 30 | 225 | 11.4 | 19 | 272 | 3.7 | 19 | 285 | 2.5 | 19 | 102 | 2.7 | 15 | 118 | 3.1 | 21 | 262 | 5.3 | | | |
| 5,000 | 19 | 214 | 12.8 | 15 | 232 | 10.4 | 19 | 295 | 5.0 | | | | 16 | 72 | 3.4 | | | | 27 | 230 | 14.8 | 13 | 274 | 4.4 | 16 | 310 | 5.1 | 19 | 70 | 3.6 | 10 | 118 | 3.3 | 18 | 265 | 5.0 | | | |
| 6,000 | 15 | 227 | 17.9 | 11 | 239 | 13.4 | 16 | 290 | 5.5 | | | | 15 | 76 | 4.3 | | | | 24 | 233 | 17.1 | 10 | 257 | 4.1 | 16 | 305 | 5.2 | 18 | 64 | 3.9 | | | | 15 | 259 | 6.8 | | | |
| 8,000 | 15 | 225 | 22.4 | | | | 15 | 296 | 4.3 | | | | 11 | 30 | 3.4 | | | | 23 | 233 | 19.6 | | | | 13 | 302 | 7.3 | 14 | 44 | 5.4 | | | | 13 | 262 | 9.7 | | | |
| 10,000 | 13 | 221 | 28.1 | | | | 12 | 324 | 5.6 | | | | | | | | | | 21 | 234 | 27.4 | | | | 10 | 299 | 8.8 | 10 | 48 | 7.4 | | | | | | | | | |
| 12,000 | 11 | 220 | 33.4 | | | | | | | | | | | | | | | | 14 | 236 | 25.8 | | | | | | | | | | | | | | | | | | |

| Altitude (meters) m.s.l. | Oakland, Calif. (8. m.) | | | Oklahoma City, Okla. (402 m.) | | | Omaha, Nebr. (306 m.) | | | Phoenix, Ariz. (388 m.) | | | Rapid City, S. Dak. (982 m.) | | | St. Louis, Mo. (181 m.) | | | St. Paul, Minn. (225 m.) | | | San Antonio, Tex. (240 m.) | | | San Diego, Calif. (15 m.) | | | Sault Ste. Marie, (230 m.) | | | Seattle, Wash. (12 m.) | | | Spokane, Wash. (603 m.) | | | Washington, D. C. (24 m.) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity |
| Surface | 29 | 261 | 6.5 | 30 | 174 | 5.9 | 29 | 182 | 2.6 | 30 | 269 | 2.2 | 28 | 153 | 1.7 | 29 | 208 | 1.5 | 30 | 230 | 2.1 | 29 | 129 | 3.6 | 30 | 269 | 4.0 | 28 | 283 | 2.8 | 30 | 262 | 2.6 | 30 | 253 | 2.0 | 30 | 219 | 2.8 |
| 500 | 29 | 276 | 4.9 | 30 | 174 | 6.5 | 29 | 178 | 4.1 | 30 | 270 | 3.6 | | | | 29 | 228 | 3.0 | 30 | 232 | 2.8 | 29 | 139 | 4.9 | 30 | 275 | 2.9 | 28 | 284 | 4.2 | 30 | 281 | 1.5 | | | | 30 | 222 | 3.6 |
| 1,000 | 27 | 292 | 2.3 | 30 | 174 | 6.9 | 28 | 190 | 4.9 | 30 | 264 | 3.8 | 28 | 152 | 1.7 | 28 | 246 | 3.9 | 27 | 237 | 4.4 | 29 | 140 | 5.1 | 25 | 264 | 1.7 | 26 | 274 | 5.4 | 25 | 274 | 1.3 | 30 | 233 | 3.0 | 28 | 249 | 3.7 |
| 1,500 | 25 | 287 | 2.0 | 30 | 183 | 6.9 | 26 | 210 | 5.8 | 30 | 243 | 3.8 | 28 | 169 | 1.3 | 28 | 260 | 4.7 | 22 | 243 | 5.9 | 29 | 150 | 4.8 | 24 | 265 | 1.9 | 24 | 275 | 6.1 | 24 | 290 | 1.0 | 28 | 225 | 3.0 | 26 | 276 | 5.5 |
| 2,000 | 22 | 266 | 1.4 | 27 | 205 | 6.5 | 22 | 234 | 7.2 | 30 | 229 | 4.4 | 27 | 198 | 2.2 | 25 | 268 | 6.7 | 21 | 265 | 6.8 | 25 | 162 | 3.8 | 23 | 243 | 4.1 | 20 | 282 | 8.0 | 22 | 263 | 0.8 | 27 | 232 | 2.8 | 24 | 287 | 7.2 |
| 2,500 | 22 | 240 | 2.1 | 25 | 216 | 7.0 | 20 | 244 | 7.5 | 30 | 226 | 6.1 | 21 | 236 | 4.9 | 19 | 259 | 6.4 | 19 | 265 | 8.5 | 24 | 170 | 2.9 | 23 | 241 | 6.2 | 18 | 291 | 9.9 | 21 | 223 | 1.2 | 21 | 244 | 3.9 | 20 | 256 | 8.9 |
| 3,000 | 22 | 266 | 3.2 | 22 | 229 | 5.3 | 19 | 250 | 7.3 | 30 | 224 | 7.3 | 19 | 252 | 6.7 | 19 | 257 | 7.6 | 13 | 266 | 9.5 | 23 | 165 | 3.3 | 20 | 230 | 8.4 | 15 | 291 | 13.4 | 19 | 230 | 2.2 | 19 | 244 | 4.6 | 19 | 291 | 9.1 |
| 4,000 | 21 | 260 | 6.4 | 19 | 243 | 4.1 | 17 | 271 | 8.8 | 30 | 224 | 9.6 | 15 | 247 | 9.8 | 15 | 254 | 8.5 | | | | 20 | 152 | 3.3 | 19 | 226 | 10.0 | 11 | 294 | 14.3 | 16 | 284 | 3.2 | 13 | 238 | 2.8 | 15 | 291 | 8.3 |
| 5,000 | 21 | 256 | 9.5 | 19 | 262 | 3.5 | 14 | 271 | 9.0 | 28 | 221 | 11.1 | 13 | 242 | 14.2 | 11 | 265 | 5.4 | | | | 18 | 155 | 3.1 | 13 | 226 | 9.5 | 10 | 297 | 15.1 | 13 | 294 | 3.2 | | | | 13 | 289 | 9.4 |
| 6,000 | 20 | 252 | 11.2 | 17 | 251 | 4.1 | 13 | 262 | 11.7 | 27 | 226 | 12.0 | 12 | 241 | 13.9 | | | | | | | 16 | 160 | 4.1 | | | | | | | 10 | 310 | 5.9 | | | | | | |
| 8,000 | 18 | 239 | 17.9 | 12 | 221 | 5.6 | 10 | 266 | 16.2 | 22 | 238 | 13.4 | | | | | | | | | | 12 | 156 | 4.3 | | | | | | | | | | | | | | | |
| 10,000 | | | | 11 | 218 | 8.7 | | | | 20 | 244 | 15.1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12,000 | | | | | | | | | | 14 | 240 | 17.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14,000 | | | | | | | | | | 10 | 242 | 13.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | |

TABLE 3.—*Maximum free-air wind velocities (m. p. s.), for different sections of the United States, based on pilot-balloon observations during June 1943*

| Section | Surface to 2,500 meters (m. s. l.) | | | | | Between 2,500 and 5,000 meters (m. s. l.) | | | | | Above 5,000 meters (m. s. l.) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Maximum velocity | Direction | Altitude (m.) m. s. l. | Date | Station | Maximum velocity | Direction | Altitude (m.) m. s. l. | Date | Station | Maximum velocity | Direction | Altitude (m.) m. s. l. | Date | Station |
| Northeast [1] | 38.9 | wnw. | 2,280 | 5 | Portland, Maine | 46.0 | wnw. | 5,000 | 6 | Caribou, Maine | 64.0 | nnw. | 8,790 | 14 | Caribou, Maine. |
| East-Central [2] | 31.1 | w. | 2,420 | 12 | Huntington, W. Va. | 30.2 | w. | 5,000 | 30 | Washington, D. C. | 31.0 | w. | 7,550 | 30 | Huntington, W. Va. |
| Southeast [3] | 24.0 | ssw. | 2,090 | 27 | Charleston, S. C. | 20.8 | wnw. | 4,660 | 9 | Spartanburg, S. C. | 26.4 | n. | 10,180 | 29 | Key West, Fla. |
| North-Central [4] | 37.9 | wsw. | 1,950 | 1 | Detroit, Mich. | 44.0 | w. | 4,900 | 4 | Sault Ste. Marie, Mich. | 69.0 | wnw. | 11,810 | 29 | Bismark, N. Dak. |
| Central [5] | 32.4 | sw. | 1,230 | 1 | Wichita, Kans. | 38.5 | wsw. | 5,000 | 1 | Omaha, Nebr. | 60.0 | sw. | 6,180 | 3 | Sioux City, Iowa. |
| South-Central [6] | 28.2 | wsw. | 1,520 | 2 | Amarillo, Tex. | 32.8 | sw. | 4,970 | 2 | Amarillo, Tex. | 36.0 | wsw. | 9,020 | 3 | Amarillo, Tex. |
| Northwest [7] | 38.2 | nw. | 1,740 | 7 | Great Falls, Mont. | 35.0 | sw. | 4,780 | 23 | Billings, Mont. | 68.0 | sw. | 8,740 | 25 | Billings, Mont. |
| | | | | | | | | | | | 68.0 | ssw. | 9,640 | 24 | Burns, Oreg. |
| West-Central [8] | 42.6 | sw. | 2,240 | 22 | Casper, Wyo. | 56.2 | ssw. | 3,800 | 21 | Ely, Nev. | 75.0 | nw. | 9,780 | 2 | Reading, Calif. |
| Southwest [9] | 28.7 | ssw. | 1,910 | 12 | Roswell, N. Mex. | 49.5 | wsw. | 4,200 | 2 | Raton, N. Mex. | 58.0 | w. | 5,320 | 3 | Albuquerque, N. Mex. |

[1] Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, and Northern Ohio.
[2] Delaware, Maryland, Virginia, West Virginia, Southern Ohio, Kentucky, Eastern Tennessee, and North Carolina.
[3] South Carolina, Georgia, Florida, and Alabama.
[4] Michigan, Wisconsin, Minnesota, North Dakota, and South Dakota.
[5] Indiana, Illinois, Iowa, Nebraska, Kansas, and Missouri.
[6] Mississippi, Arkansas, Louisiana, Oklahoma, Texas (except El Paso), and Western Tennessee.
[7] Montana, Idaho, Washington, and Oregon.
[8] Wyoming, Colorado, Utah, Northern Nevada, and Northern California.
[9] Southern California, Southern Nevada, Arizona, New Mexico, and extreme West Texas.

## RIVER STAGES AND FLOODS]

By BENNETT SWENSON

Following a month of excessive precipitation and disastrous flooding in the interior of the country in May, the area of above-normal precipitation during June shifted slightly northward and westward. All States from the Rocky Mountains westward, except Arizona, had above-normal amounts, Utah having nearly four times the normal. East of the Rockies, most States north of the 36° latitude had above normal; the exceptions were Indiana, the upper Ohio Valley, the northern Appalachian Region and portions of the Middle Atlantic States.

Excessive flooding occurred in northeast Texas, Kansas, Nebraska, Montana, Minnesota, Iowa, Missouri, Wisconsin, and northern New England. On the other hand, river stages during June were generally considerably below normal in the southern tier of States from Arizona to Florida, except in the lower Mississippi River.

*Atlantic Slope drainage.*—Heavy rains on June 15–16 caused destructive floods in the upper Connecticut River Basin, and in the headwaters of the Androscoggin and Kennebec Rivers in Maine. The rainfall was in the form of heavy thundershowers which occurred almost entirely within a 24-hour period. In the Connecticut Basin above North Stratford, N. H., the rainfall ranged from 1 to nearly 5 inches. The Connecticut River reached a stage of 14.65 feet at North Stratford on the night of the 16th, exceeding the previous high stage of record, 14.6 feet in March 1936. Flood stage was not exceeded downstream from that point.

Heavy rains on June 1–2 over the upper Susquehanna River Basin caused slight overflows in the Chenango River at Sherburne, N. Y., and in the Susquehanna River at Oneonta, N. Y.

Light to moderate flooding in the Neuse River at Smithfield and Goldsboro, N. C., on June 9–16 resulted from heavy showers and thunderstorms on June 8–9. In the middle portion of the Neuse Basin the precipitation ranged from 1.25 to more than 4.5 inches.

*Upper Mississippi Basin.*—Abnormally heavy rainfall during May continued into June in most of the upper Mississippi River watershed and caused high stages with flooding generally in the tributaries and the main river during June. The Minnesota River, the Chippewa, Black, and Wisconsin Rivers in Wisconsin, the Raccoon and Des Moines Rivers in Iowa, and the Salt and Meramec Rivers in Missouri were the principal tributaries in flood. The Illinois River, which was in record flood in May continued above flood stage through most of June, and at Beardstown, Ill., the river did not recede to bankful until July 2.

The main Mississippi River was in moderate to severe flood from the headwaters to the mouth of the Ohio River. At St. Louis, the Missouri River flood waters combined with the high water in the Mississippi River to produce a crest of 35.2 feet at St. Louis on June 26, only 3.7 feet below the high flood crest of May 24.

The following report of the June flood in the headwaters of the Mississippi watershed above Hastings, Minn., is submitted by the official in charge, Weather Bureau office, Minneapolis, Minn.:

Abnormally heavy rainfalls throughout the month of May continued during June over this basin and as a result the river was in flood for an unusually long period of time. The average rainfall for May, as determined from 18 stations in the headwaters basin, was 5.12 inches, or 2.13 inches above normal. For the month of June the average rainfall was 6.21 inches or 2.15 inches above normal. The run-off of the Rum River and the Mississippi River at Anoka, Minn., a few miles above Minneapolis, exceeded any June of record. However, the flood stage was not reached at Minneapolis, but was almost attained at St. Paul. The Minnesota River contributed a high discharge into the Mississippi River above the St. Paul gage as the United States Geological Survey records reveal that the peak discharge of the Minnesota River at Carver, Minn., was close to the maximum record of 23,000 c. f. s.

Cautionary river forecasts were issued on June 4 for the Twin Cities and on June 15 for the Mississippi River from Little Falls to Hastings Dam and for the Minnesota River from New Ulm to Mendota, Minn. Damage was mainly agricultural because the lowlands along the streams were inundated. Early seeded crops were destroyed, pasture lands were reduced and damaged, and much difficulty was experienced in the care of livestock and poultry. The total losses, practically all to prospective crops, has been placed at $100,000. Savings as a result of the advisory warnings and daily advices to inquirers is placed at $25,000.

*Missouri Basin.*—Heavy rains occurred over most of Montana on June 2–3, and over the north central portion about the middle of the month. Largely as a result of the latter rains, floods occurred in the Marias, Teton, Musselshell, portions of the Yellowstone, and in the Missouri

River in the vicinity of Fort Benton, Mont., with the highest stages for a number of years being observed.

Rainfall averaging about 2 inches in the Big Sioux River Basin from above Sioux Falls, S. Dak., to below Akron, Iowa, and also in the Rock River tributary in mid-June, caused considerable overflow from Sioux Falls to above Sioux City, Iowa. Some overflow also occurred in the James, Vermillion, and Floyd Rivers.

Excessive rainfall in the vicinity of Omaha, Nebr., on June 2–3, resulted in a flash flood in Papillion Creek. Damage caused by the rainfall and overflow has been estimated at about $350,000.

Frequent heavy rains over the Kansas River Basin beginning on June 5 and continuing until June 16 caused damaging floods in much of the basin. The greatest damage occurred along the main Kansas River with two distinct overflows. The second crested at Topeka, Kans., at 26.75 feet on June 17, the highest since June 1935. Below Le Compton, Kans., the stages exceeded the flood of 1935.

In addition to great crop losses in the Kansas Basin railway service was interrupted for a few days from Manhattan, Kans., through Topeka to Lawrence, Kans., and highways between those points were flooded. Dykes in the vicinity of Lawrence were broken with much damage to lowlands.

The Republican River overflowed its banks between Scandia, Kans., and the mouth from June 11 to 18.

The Big Blue and Solomon Rivers overflowed twice, the Big Blue from Beatrice, Nebr., to its mouth and the Solomon in the vicinity of Beloit, Kans.

Heavy rains on June 15–16 caused overflows in the Delaware and Big Stranger Rivers in Kansas, the Little Platte in Missouri, and the Nemaha in Nebraska, and in the Missouri River from Nebraska City, Nebr., downstream. At Kansas City a stage of 29.1 feet was reached on June 18–19, the highest stage since 1908. Approximately a third of the discharge in the Missouri at Kansas City was contributed by the Kansas River. Below Kansas City, serious dyke breaks occurred and flooded much farmland, inflicting serious damage to buildings, bridges, highways, and crops.

The upper Osage River in Kansas exceded flood stage on four occasions during the month, but only light flooding occurred below the Kansas-Missouri line. Moderately severe flood conditions prevailed in the Grand River from Gallatin, Mo., to the mouth.

*Arkansas Basin.*—Moderate overflows occurred in the Neosho River from Council Grove to Oswego, Kans., from June 16 to 27 and a slight overflow in the Arkansas River between Fort Smith and Dardanelle, Ark., on June 8 and 9.

*Red Basin.*—Except for light flooding in the Ouachita River at Arkadelphia, Ark., on June 1, and in the Sulphur River at Hagansport and Naples, Tex., on June 7–17, stages in the Red Basin were generally well below normal.

*Lower Mississippi Basin.*—The St. Francis River, which reached flood stage in May, continued in flood through most of June.

The extensive flooding during May in the Missouri, Ohio, Arkansas, and White River Basins produced above-flood stage in the lower Mississippi to its mouth. The crest reached New Orleans, La., on June 12 at a stage of 18.2 feet, 1.2 feet above flood stage. The flooding during May and June in the Mississippi System will be discussed in more detail in a later issue of the REVIEW.

*West Gulf of Mexico drainage.*—Excessive rains over the upper Sabine watershed on June 6 caused the highest stages of record in the upper portions and flooded lowlands south of Logansport, La., to below Milam, Tex., where the flood finally flattened out to within the confines of the river banks.

Kaufman, Tex., south of the Sabine Basin, reported 9.18 inches of rainfall for the week ending June 8, and unofficial rainfall reports indicate that the Grand Saline, Tex., area had more than 13 inches of precipitation on June 6.

On June 7 the water at Grand Saline reached the highest point ever known and on June 8 the peak stage near Mineola, Tex., was 24.4 feet, 3.8 feet above the maximum known stage according to the United States Geological Survey. This peak reached Gladewater, Tex., on June 11, with a stage of 41.2 feet. The highest previous stage known was 39.4 feet in January 1932.

By June 19 the river was above flood stage, 25 feet, at Logansport, La., with the gage reading 27.2 feet, and remained above flood stage there until July 1. The crest at Logansport was 33.4 feet on June 21–22, considerably below the maximum stage of 39.4 feet which occurred in May 1884. At Bon Wier, Tex., the river rose to only 0.3 foot above flood stage.

Floods in the upper Trinity River Basin were produced by unusually heavy rains which fell over the East Fork of the Trinity drainage and the main Trinity from below Dallas, Tex., to near Trinidad, Tex., on June 5–6. The greatest damage occurred from the rapid rise and overflows in the small tributaries of the East Fork. Flood stage was exceeded by 4 feet in the East Fork at Rockwall Tex., on June 6. Slightly over 10 inches of rain occurred at Rockwall between 8:30 p. m. June 5 and 7:30 a. m. June 6. The main Trinity overflowed along its entire length downstream to Liberty, Tex., where the crest just reached flood stage, 24 feet, on June 24–25.

*Pacific Slope drainage.*—Tulare Lake reached its highest elevation on June 10–11 at 196.08 feet. River flow was moderately high at the beginning of the month, 9.2 feet (flood stage 10 feet) at Piedra, Calif., on the Kings River on June 1, but subsided under the influence of subnormal temperatures and remained at moderate stages the remainder of the month.

The flooded area continued to enlarge as additional water overflowed through breaks in the lake levees until a total of 112,000 acres were covered by water. After June 11, the elevation of the lake fell gradually to 195.67 feet on June 28. It is estimated that an additional loss to crops and farm lands of $250,000 occurred during the month.

The Columbia River rose, exceeding flood stage during the month in the lower portion from The Dalles, Oreg., downstream. The highest stage reached during June was 19.8 feet at Portland, Oreg., on June 24 and 19.9 feet at Vancouver Wash., on June 23–24. A further report will be made in the next issue of the REVIEW.

## FLOOD-STAGE REPORT JUNE 1943

[All dates in June unless otherwise specified]

| River and station | Flood stage | Above flood stages—dates From— | To— | Crest Stage | Date |
|---|---|---|---|---|---|
| ST. LAWRENCE DRAINAGE | | | | | |
| *Lake Michigan* | | | | | |
| | *Feet* | | | *Feet* | |
| Red Cedar: Williamston, Mich | 7 | 1 | 1 | 7.2 | 1 |
| Grand: | | | | | |
| Eaton Rapids, Mich | 6 | May 31 | 6 | 7.8 | 3 |
| Lansing, Mich | 11 | 1 | 4 | 12.5 | 3 |
| *Lake Huron* | | | | | |
| Flint: Flint, Mich | 10 | 1 | 2 | 13.0 | 2 |
| ATLANTIC SLOPE DRAINAGE | | | | | |
| Connecticut: North Stratford, N. H | 13 | 16 | 17 | 14.65 | 16 |
| Chenango: Sherburne, N. Y | 8 | 2 | 2 | 8.9 | 2 |
| Susquehanna: Oneonta, N. Y | 12 | 1 | 4 | [1] 14.5 | 2 |
| Neuse: | | | | | |
| Smithfield, N. C | 13 | 9 | 12 | 15.8 | 10 |
| Goldsboro, N. C | 14 | 12 | 16 | 15.3 | 15 |
| MISSISSIPPI SYSTEM | | | | | |
| *Upper Mississippi Basin* | | | | | |
| Minnesota: Mankato, Minn | 19 | 16 | 19 | 19.3 | 18 |
| Chippewa: Durand, Wis | 11 | 1 | 4 | 11.8 | 3 |
| | | 16 | 23 | 13.8 | 18 |
| | | 28 | (2) | | |
| Black: | | | | | |
| Neillsville, Wis | 18 | 28 | 28 | 22.6 | 28 |
| Galesville, Wis | 12 | May 31 | 3 | 12.9 | 1 |
| | | 30 | (2) | | |
| Wisconsin: Wisconsin Rapids, Wis | 12 | 1 | 2 | 12.5 | 1 |
| | | 28 | 29 | 13.9 | 29 |
| Raccoon: Van Meter, Iowa | 13 | 16 | 16 | 13.0 | 16 |
| Des Moines: | | | | | |
| Eddyville, Iowa | 15 | 11 | 13 | 16.8 | 13 |
| Ottumwa, Iowa | 9 | 13 | 13 | 9.0 | 13 |
| Salt: New London, Mo | 19 | 11 | 12 | 21.3 | 11 |
| Illinois: | | | | | |
| Peru, Ill | 17 | May 11 | 11 | [1] 28.0 | May 22 |
| Peoria, Ill | 18 | May 13 | 15 | 28.6 | May 23 |
| Havana, Ill | 14 | May 3 | 27 | 27.3 | May 25 |
| Beardstown, Ill | 14 | May 8 | July 2 | 29.7 | May 26–27 |
| Bourbeuse: Union, Mo | 12 | 7 | 10 | 13.0 | 9 |
| Meramec: | | | | | |
| Sullivan, Mo | 11 | 7 | 9 | 11.1 | 7 |
| Pacific, Mo | 11 | 6 | 11 | 16.5 | 9 |
| Valley Park, Mo | 14 | 7 | 12 | 17.4 | 10 |
| Mississippi: | | | | | |
| Aitkin, Minn.[3] | 12 | 1 | July 6 | 15.0 | 20–21 |
| Fort Ripley, Minn | 10 | 2 | 8 | 10.5 | 3 |
| | | 12 | July 4 | 11.8 | 17 |
| Reads, Minn | 12 | 19 | 24 | 12.6 | 20–21 |
| Winona, Minn | 13 | 19 | 27 | 14.8 | 22 |
| La Crosse, Wis | 12 | 19 | 28 | 13.3 | 22–23 |
| Dubuque, Iowa | 18 | 25 | July 1 | 18.9 | 28–29 |
| Gordons Ferry, Iowa | 13 | 7 | | 17.0 | 29 |
| | 16 | 13 | 15 | 16.1 | 13–14 |
| Clinton, Iowa | | 26 | (2) | | |
| Muscatine, Iowa | 15 | 13 | 18 | 15.4 | 15 |
| | | 27 | | | |
| | | 14 | 19 | 12.1 | 16–18 |
| Keithsburg, Ill | 12 | 29 | July 6 | 12.4 | July 3 |
| | | July 9 | July 14 | 12.4 | July 12 |
| Keokuk, Iowa | 12 | 11 | July 17 | 14.5 | 18 |
| Gregory Landing, Mo | 12 | 11 | | 14.8 | 18 |
| Quincy, Ill | 14 | 8 | July 18 | 17.4 | 18 |
| Hannibal, Mo | 13 | 6 | July 20 | 17.7 | 18 |
| Louisiana, Mo | 12 | 6 | July 20 | 16.0 | 18 |
| Grafton, Ill | 18 | May 18 | 2 | 29.0 | May 24 |
| | | 6 | (2) | 22.9 | 21 |
| St. Louis, Mo | 30 | 9 | July 1 | 35.2 | 26 |
| Chester, Ill | 27 | May 18 | 4 | 38.0 | May 25 |
| | | 8 | July 3 | 32.9 | 28 |
| Cape Girardeau, Mo | 32 | 9 | July 5 | 36.7 | 29 |
| *Missouri Basin* | | | | | |
| Big Sioux: Akron, Iowa | 12 | 12 | 29 | 17.4 | 18 |
| Floyd: James, Iowa | 14 | 17 | 18 | 15.2 | 17 |
| Solomon: | | | | | |
| Beloit, Kans | 18 | 12 | 14 | 24.75 | 13 |
| | | 15 | 19 | 27.8 | 18 |
| Niles, Kans | 24 | 16 | 22 | 27.6 | 17 |
| Republican: | | | | | |
| Scandia, Kans | 10 | 11 | 12 | 11.5 | 11 |
| | | 15 | 15 | 11.4 | 15 |
| Concordia, Kans | 8 | 11 | 13 | 9.9 | 11 |
| | | 15 | 16 | 9.9 | 15 |
| Clay Center, Kans | 14 | 11 | 18 | 17.8 | 14 |
| | | | | 18.7 | 16 |
| Wakefield, Kans | 11 | 15 | 17 | 12.7 | 16 |
| Junction City, Kans | 10 | 16 | 17 | 12.5 | 16–17 |
| Little Blue: Hanover, Kans | 14 | 10 | 18 | 20.0 | 12 |
| Big Blue: | | | | | |
| Beatrice, Nebr | 16 | 10 | 10 | 17.9 | 10 |
| | | 11 | 13 | 20.2 | 13 |
| Blue Rapids, Kans | 20 | 8 | 18 | 31.3 | 13 |
| | | | | 28.85 | 17 |

## FLOOD-STAGE REPORT JUNE 1943—Continued

[All dates in June unless otherwise specified]

| River and station | Flood stage | Above flood stages—dates From— | To— | Crest Stage | Date |
|---|---|---|---|---|---|
| MISSISSIPPI SYSTEM—continued | | | | | |
| *Missouri Basin*—Continued | | | | | |
| Kansas: | *Feet* | | | *Feet* | |
| Ogden, Kans | 18 | 16 | 18 | 19.04 | 16 |
| Manhattan, Kans | 17 | 10 | 19 | 20.2 | 10–11 |
| | | | | 23.0 | 16–17 |
| Wamego, Kans | 16 | 11 | 19 | 20.9 | 17 |
| Topeka, Kans | 21 | 10 | 12 | 25.2 | 11 |
| | | 14 | 19 | 26.75 | 17 |
| LeCompton, Kans | 17 | 9 | 12 | 21.6 | 11 |
| | | 15 | 19 | 22.7 | 17 |
| Lawrence, Kans | 18 | 11 | 11 | 21.5 | 11 |
| | | 15 | 19 | 23.9 | 18 |
| Grand: | | | | | |
| Gallatin, Mo | 20 | 6 | 14 | 27.0 | 12 |
| | | 16 | 18 | 24.1 | 17 |
| Chillicothe, Mo | 18 | 6 | 20 | 29.2 | 17 |
| Brunswick, Mo | 12 | 7 | (2) | 23.3 | 20 |
| Osage: | | | | | |
| Quenemo, Kans | 30 | 11 | 12 | 35.0 | 11 |
| | | 17 | 18 | 34.6 | 17 |
| | | 23 | 24 | 32.7 | 24 |
| | | 29 | 29 | 31.4 | 29 |
| | | 12 | 13 | 25.5 | 13 |
| Ottawa, Kans | 24 | 17 | 19 | 27.5 | 18 |
| | | 24 | 25 | 26.0 | 24 |
| La Cygne, Kans | 25 | 18 | 20 | 25.5 | 19 |
| | | 25 | 27 | 27.5 | 27 |
| Osceola, Mo | 20 | May 10 | 1 | 28.7 | May 13 |
| | | | | 41.5 | May 21 |
| Lakeside (Bagnell Dam), Mo | 60 | May 10 | 1 | 62.3 | May 13–14 |
| | | | | 65.4 | May 22 |
| | | 4 | 11 | 60.8 | 5 |
| St. Thomas, Mo | 23 | May 12 | 1 | 43.8 | May 20 |
| | | 5 | 12 | (4) | 7 |
| Missouri: | | | | | |
| Nebraska City, Nebr | 15 | 13 | 21 | 17.0 | 17 |
| St. Joseph, Mo | 17 | 16 | 21 | 18.55 | 18 |
| Kansas City, Mo | 22 | 10 | 22 | 29.1 | 18–19 |
| Lexington, Mo | 22 | 10 | 26 | 28.4 | 19 |
| Waverly, Mo | 18 | 9 | 27 | 24.4 | 19 |
| Boonville, Mo | 21 | 11 | 28 | 28.7 | 22 |
| Hermann, Mo | 21 | 8 | 30 | 28.0 | 24 |
| St. Charles, Mo | 25 | May 12 | 1 | 26.3 | May 13 |
| | | | | 36.6 | May 22 |
| | | 7 | (2) | 33.4 | 26 |
| *Ohio Basin* | | | | | |
| West Fork of White: Edwardsport, Ind | 12 | 8 | 11 | 14.6 | 10 |
| *White Basin* | | | | | |
| Black: Black Rock, Ark | 14 | May 11 | 6 | 26.2 | May 12 |
| | | | | 23.5 | May 19 |
| White: | | | | | |
| Georgetown, Ark | 21 | May 13 | 14 | 31.4 | May 18 |
| | | | | 29.3 | May 26 |
| Des Arc, Ark | 24 | May 16 | 12 | 34.9 | May 20 |
| Clarendon, Ark | 26 | May 17 | 21 | 33.2 | May 30 |
| | | | | | June 1 |
| St. Charles, Ark | 25 | May 20 | 25 | 35.4 | 3 |
| *Arkansas Basin* | | | | | |
| Neosho: | | | | | |
| Council Grove, Kans | 24 | 16 | 16 | 28.9 | 16 |
| Neosho Rapids, Kans | 22 | 17 | 18 | 25.1 | 17–18 |
| Burlington, Kans | 23 | 18 | 19 | 27.15 | 19 |
| | | 23 | 24 | 24.65 | 23 |
| Iola, Kans | 15 | 23 | 25 | 17.4 | 24 |
| Chanute, Kans | 20 | 24 | 25 | 21.5 | 24 |
| Oswego, Kans | 17 | 23 | 27 | 19.6 | 24 |
| North Canadian: Canton, Okla | 9 | 8 | 9 | 9.0 | 8 |
| Petit Jean: Danville, Ark | 20 | 1 | 2 | 21.1 | 1 |
| Arkansas: | | | | | |
| Fort Smith, Ark | 22 | 8 | 8 | 22.4 | 8 |
| Van Buren, Ark | 22 | 8 | 8 | 22.8 | 8 |
| Dardanelle, Ark | 22 | 9 | 9 | 22.1 | 9 |
| *Red Basin* | | | | | |
| Ouachita: Arkadelphia, Ark | 17 | 1 | 1 | 17.1 | 1 |
| Sulphur: | | | | | |
| Hagansport, Tex | 28 | 7 | 11 | 40.1 | 8–9 |
| Naples, Tex | 22 | 10 | 17 | 27.1 | 12–13 |
| *Lower Mississippi Basin* | | | | | |
| Big Lake Outlet: Manila, Ark | 10 | May 14 | 6 | 19.3 | 31 |
| St. Francis: | | | | | |
| Fisk, Mo | 20 | 3 | 29 | 20.9 | 14, 16–20 |
| St. Francis, Ark | 16 | May 27 | 30 | 19.3 | May 31 |
| Mississippi: | | | | | |
| Helena, Ark | 44 | 1 | 12 | 46.9 | 7 |
| Arkansas City, Ark | 42 | May 30 | 13 | 44.2 | 4 |
| Greenville, Miss | 39 | May 29 | 16 | 42.3 | 4–6 |
| Vicksburg, Miss | 43 | 5 | 14 | 43.4 | 9 |
| Natchez, Miss | 48 | 5 | 19 | 49.6 | 12 |
| Red River Landing, La | 45 | 2 | 24 | 48.4 | 11–14 |
| Baton Rouge, La | 35 | 2 | 25 | 38.8 | 14–15 |

See footnotes at end of table.

## FLOOD-STAGE REPORT JUNE 1943—Continued

[All dates in June unless otherwise specified]

| River and station | Flood stage | Above flood stages—dates | | Crest | |
|---|---|---|---|---|---|
| | | From— | To— | Stage | Date |
| MISSISSIPPI SYSTEM—con. | | | | | |
| *Lower Mississippi Basin*—Con. | | | | | |
| Mississippi—Con. | *Feet* | | | *Feet* | |
| Donaldsonville, La. | 28 | 4 | 24 | 30.5 | 13-15 |
| Reserve, La. | 22 | 5 | 23 | 23.7 | 13 |
| New Orleans, La. | 17 | 5 | 23 | 18.2 | 12 |
| *Atchafalaya Basin* | | | | | |
| Atchafalaya: | | | | | |
| Melville, La. | 37 | 7 | 23 | 38.1 | 15-17 |
| Atchafalaya, La. | 25 | 6 | 26 | 25.5 | 10-18 |
| WEST GULF OF MEXICO DRAINAGE | | | | | |
| Sabine: Logansport, La. | 25 | 19 | July 1 | 33.4 | 21-22 |
| East Fork of Trinity: Rockwall (nr.), Tex. | 10 | 5 | 10 | 14.4 | 6 |

[1] Estimated.
[2] Above flood stage at end of month.

## FLOOD-STAGE REPORT JUNE 1943—Continued

[All dates in June unless otherwise specified]

| River and station | Flood stage | Above flood stages—dates | | Crest | |
|---|---|---|---|---|---|
| | | From— | To— | Stage | Date |
| WEST GULF OF MEXICO DRAINAGE—con. | | | | | |
| Trinity: | *Feet* | | | *Feet* | |
| Dallas, Tex. | 28 | 7 | 8 | 30.7 | 7 |
| Rosser, Tex. | 26 | 7 | 11 | 30.8 | 8 |
| Trinidad, Tex. | 28 | 7 | 18 | 36.4 | 12 |
| Long Lake, Tex. | 40 | 13 | 19 | 41.4 | 15 |
| Liberty, Tex. | 24 | 24 | 25 | 24.0 | 24-25 |
| PACIFIC SLOPE DRAINAGE | | | | | |
| *Columbia Basin* | | | | | |
| Willamette: Portland, Oreg. | 18 | 1 | 8 | 19.7 | 5 |
| | | 20 | [3] | 19.8 | 24 |
| Columbia: | | | | | |
| The Dalles, Oreg. | 40 | May 28 | [3] | 42.8 | 3 |
| | | | | 43.5 | 21 |
| Vancouver, Wash. | 15 | May 29 | [3] | 19.7 | 5 |
| | | | | 19.9 | 23-24 |

[3] Records furnished by U. S. Engineers.
[4] Unknown, gage out.

# CLIMATOLOGICAL DATA

## CONDENSED CLIMATOLOGICAL SUMMARY OF TEMPERATURE AND PRECIPITATION BY SECTIONS

[For description of tables and charts, see REVIEW January 1942, p. 15]

In the following table are given for the various sections of the climatological service of the Weather Bureau the monthly average temperature and total rainfall; the stations reporting the highest and lowest temperatures, with dates of occurrence; the stations reporting the greatest and least total precipitation; and other data as indicated by the several headings.

The mean temperature for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperatures and precipitation are based only on records from stations that have 10 or more years of observations. Of course, the number of such records is smaller than the total number of stations.

| Section | Temperature | | | | | | | Precipitation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Monthly extremes | | | | | | | Greatest monthly | | Least monthly | |
| | Section average | Departure from the normal | Station | Highest | Date | Station | Lowest | Date | Section average | Departure from the normal | Station | Amount | Station | Amount |
| | °F. | °F. | | °F. | | | °F. | | In. | In. | | In. | | In. |
| Alabama | 81.8 | +3.5 | 5 stations | 101 | [1] 2 | Muscle Shoals | 58 | 30 | 3.50 | −0.70 | Evergreen | 8.68 | Arley | 0.31 |
| Arizona | 74.0 | −1.3 | Mohawk | 113 | [1] 17 | Fort Valley | 21 | 15 | .32 | −.04 | Fort Grant | 2.90 | 28 stations | .00 |
| Arkansas | 79.8 | +2.7 | 2 stations | 102 | [1] 20 | Lead Hill | 47 | 30 | 2.86 | −1.19 | Mountainburg | 7.42 | Index | .10 |
| California | 64.2 | −3.8 | Greenland Ranch | 115 | 18 | Ellery Lake | 14 | 4 | .37 | +.05 | Mineral | 3.93 | 94 stations | .00 |
| Colorado | 61.1 | −.6 | Las Animas | 107 | 23 | Winter Park | 14 | 3 | 1.49 | +.07 | Crested Butte | 7.05 | Bloom | .04 |
| Florida | 81.1 | +1.3 | Monticello | 106 | 6 | 2 stations | 60 | [1] 21 | 6.66 | −.14 | Bradenton | 23.30 | River Junction | 1.21 |
| Georgia | 80.8 | +2.6 | 2 stations | 105 | [1] 6 | Tallapoosa | 52 | 2 | 4.33 | −.14 | Adel | 9.12 | Cartersville | .90 |
| Idaho | 56.5 | −3.8 | Grand View | 101 | 17 | Spencer | 21 | 6 | 2.09 | +.76 | Roland | 4.58 | St. Anthony | .69 |
| Illinois | 73.1 | +2.9 | 2 stations | 99 | 24 | Sycamore | 39 | 30 | 3.84 | −.11 | Pleasant Hill | 7.85 | Elgin | 1.12 |
| Indiana | 75.6 | +4.0 | Huntingburg | 100 | 24 | Huntington | 38 | 30 | 3.58 | −.32 | Evansville | 9.30 | Evans Landing | 1.03 |
| Iowa | 71.6 | +2.0 | Onawa | 101 | 27 | 2 stations | 37 | [1] 4 | 6.16 | +1.49 | Riverton (near) | 13.70 | Cresco | 1.94 |
| Kansas | 75.4 | +1.6 | 3 stations | 109 | 24 | Goodland | 36 | 4 | 5.54 | +1.50 | McFarland | 14.23 | Utica | .76 |
| Kentucky | 77.5 | +3.6 | Paducah | 100 | 13 | St. John | 46 | 30 | 4.04 | −.14 | Berea | 8.61 | Russellville | 1.71 |
| Louisiana | 82.1 | +2.0 | Winnfield | 102 | 21 | Enon Tower | 61 | 18 | 4.04 | −.73 | Covington | 9.60 | Lake Providence | .78 |
| Maryland-Delaware | 76.5 | +5.6 | 2 stations | 100 | [1] 25 | 2 stations | 41 | 30 | 2.79 | −1.18 | Dover, Del. | 6.99 | Mt. Savage Summit, Md. | .02 |
| Michigan | 66.7 | +2.3 | Wayne | 100 | 25 | 3 stations | 29 | [1] 8 | 4.79 | +1.67 | Steuben | 10.86 | Benton Harbor | 1.08 |
| Minnesota | 65.7 | +.8 | Winona | 100 | 26 | Big Falls | 29 | 5 | 5.67 | +1.61 | Fairmont | 9.52 | Milaca | 1.99 |
| Mississippi | 82.3 | +3.4 | 2 stations | 102 | [1] 22 | Batesville | 58 | 30 | 2.64 | −1.57 | Utica | 6.15 | Tupelo | .35 |
| Missouri | 75.8 | +2.2 | Shelbina | 101 | 27 | Edgerton | 43 | 30 | 6.39 | +1.67 | St. Joseph | 15.71 | Campbell | 1.56 |
| Montana | 55.9 | −3.9 | 2 stations | 98 | [1] 22 | Kings Hill | 11 | 6 | 4.00 | +1.48 | Sentinel Butte Pass | 8.25 | Whitehall (near) | 1.33 |
| Nebraska | 69.3 | −.1 | Culbertson | 108 | 24 | 3 stations | 30 | 4 | 4.36 | +.70 | Tecumseh | 15.64 | Sidney | 1.14 |
| Nevada | 61.1 | −3.4 | Overton | 109 | [1] 18 | Fish Creek Ranch | 19 | 3 | .96 | +.45 | Ruby Lake | 3.94 | 8 stations | .00 |
| New England | 66.9 | +2.9 | East Wareham, Mass. | 99 | 26 | Vanceboro, Maine | 28 | [1] 1 | 3.49 | +.02 | W. Stewartstown, N. H. | 10.11 | New Bedford, Mass. | 1.05 |
| New Jersey | 74.2 | +5.2 | 2 stations | 102 | 26 | Charlotteburg | 43 | 12 | 3.24 | −.39 | Belvidere | 5.69 | Belmar | 1.46 |
| New Mexico | 69.1 | +.3 | Orogrande | 108 | 23 | Tohatchi | 19 | 10 | 1.82 | +.55 | Thayer Ranch | 7.67 | Gower | .03 |
| New York | 69.8 | +4.7 | Sodus | 102 | 26 | Indian Lake | 31 | 9 | 3.68 | +.04 | Setauket | 10.10 | Oswego | 1.87 |
| North Carolina | 78.3 | +4.2 | Mount Gilead | 106 | 5 | Banners Elk | 49 | 21 | 5.24 | +.55 | Pisgah Forest | 11.71 | Hatteras | 1.03 |
| North Dakota | 60.4 | −2.5 | Mott | 102 | 22 | Golva | 28 | 3 | 5.07 | +1.61 | Hankinson | 8.06 | Larimore | 2.41 |
| Ohio | 74.7 | +5.0 | 3 stations | 99 | [1] 24 | 4 stations | 40 | 30 | 3.37 | −.53 | Defiance | 6.97 | Wooster No. 2 | .61 |
| Oklahoma | 79.5 | +2.3 | Alva | 105 | [1] 24 | Kenton | 43 | 3 | 2.76 | −1.15 | Grove | 7.86 | Watonga | .24 |
| Oregon | 55.8 | −3.7 | 2 stations | 96 | [1] 29 | 2 stations | 22 | 10 | 2.00 | +.72 | 2 stations | 8.26 | Harper | .30 |
| Pennsylvania | 73.0 | +4.8 | Phoenixville | 101 | [1] 4 | Kane | 35 | 30 | 3.34 | −.78 | Sharon | 7.11 | Hyndman | .71 |
| South Carolina | 81.2 | +3.6 | 5 stations | 105 | 6 | 2 stations | 59 | [1] 3 | 4.27 | −.50 | Gaston Shoals | 8.39 | 2 stations | 2.28 |
| South Dakota | 65.5 | −.9 | 3 stations | 104 | [1] 25 | Custer | 26 | 4 | 5.29 | +1.83 | Centerville | 9.93 | Murdo | 2.31 |
| Tennessee | 79.0 | +4.2 | 4 stations | 100 | [1] 6 | Bolivar | 51 | 30 | 3.15 | −1.03 | Tellico Plains | 7.12 | Bolivar | .83 |
| Texas | 80.9 | +.7 | Rio Grande | 112 | 27 | 2 stations | 46 | [1] 3 | 2.37 | −.59 | Kaufman | 10.14 | Port Isabel | .02 |
| Utah | 61.8 | −2.8 | Green River | 103 | 26 | Soldier Summit | 21 | 3 | 2.10 | +1.48 | Silver Lake (Brighton) | 7.38 | St. George | T |
| Virginia | 76.8 | +4.9 | Capron | 101 | [1] 4 | Big Meadows | 38 | 19 | 4.20 | −.01 | Stuart | 11.60 | Fredericksburg | 1.20 |
| Washington | 58.4 | −2.6 | Wahluke (near) | 99 | 29 | Stockdill Ranch | 24 | 2 | 1.78 | +.18 | Carbon River Ent. R. N. P. | 8.64 | 2 stations | .22 |
| West Virginia | 75.0 | +5.2 | Martinsburg | 102 | 25 | Pickens | 42 | 30 | 3.64 | −.83 | Flat Top | 7.87 | Cacapon State Park | 1.08 |
| Wisconsin | 67.8 | +2.6 | 5 stations | 97 | [1] 22 | Ashland | 31 | 7 | 5.75 | +1.64 | Ladysmith | 15.86 | Arlington | 1.93 |
| Wyoming | 57.1 | −1.6 | Colony | 99 | 22 | South Pass City | 6 | 3 | 1.95 | +.31 | Hulett | 4.87 | Diversion Dam | .16 |
| Alaska (May) | 44.0 | +2.4 | Unuk River | 83 | 31 | Wainwright | 12 | 6 | 1.50 | −.10 | Little Port Walter | 13.56 | Wainwright | .09 |
| Hawaii | 74.7 | +1.2 | Kannapoli | 94 | 13 | Volcano Observatory | 52 | [1] 15 | 5.69 | +.85 | Honomaele | 29.84 | 14 stations | .00 |
| Puerto Rico | 77.3 | −.8 | Utuado | 95 | [1] 2 | Guineo Reservoir | 55 | 1 | 7.35 | +1.34 | La Mina | 20.94 | Ensenada | 1.67 |

[1] Other dates, also.

## CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS

| District and station | Elevation of instruments: Barometer above sea level | Elevation of instruments: Thermometer above ground | Elevation of instruments: Anemometer above ground | Pressure: Mean station | Pressure: Mean sea level | Pressure: Departure from normal | Temperature of the air: Mean max. + mean min. ÷ 2 | Temperature of the air: Departure from normal | Temperature of the air: Maximum | Temperature of the air: Date | Temperature of the air: Mean maximum | Temperature of the air: Minimum | Temperature of the air: Date | Temperature of the air: Mean minimum | Temperature of the air: Greatest daily range | Temperature of the air: Mean temperature of the dew point | Mean relative humidity | Precipitation: Total | Precipitation: Departure from normal | Precipitation: Days with 0.01 inch or more | Wind: Average hourly velocity | Wind: Prevailing direction | Wind: Maximum velocity: Miles per hour | Wind: Maximum velocity: Direction | Wind: Maximum velocity: Date | Clear days | Partly cloudy days | Cloudy days | Average cloudiness, tenths | Total snowfall | Snow, sleet, and ice on ground at end of month | Number of days with thunderstorms |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Ft.* | *Ft.* | *Ft.* | *In.* | *In.* | *In.* | *°F.* | *°F.* | *°F.* | | *°F.* | *°F.* | | *°F.* | *°F.* | *°F.* | % | *In.* | *In.* | | *Miles* | | | | | | | | *0–10* | *In.* | *In.* | |
| **New England** | | | | | | | **65.5** | **+3.1** | | | | | | | | | **75** | **3.18** | **+0.1** | | | | | | | | | | **5.3** | | | |
| Eastport | 75 | 67 | 85 | 29.82 | 29.91 | −0.02 | 55.8 | +0.7 | 85 | 25 | 64 | 41 | 1 | 47 | 32 | 48 | 80 | 6.01 | +3.0 | 14 | 8.4 | sw. | 26 | ne. | 29 | 6 | 10 | 14 | 6.3 | 0.0 | 0.0 | 5 |
| Greenville, Maine | 1,070 | 6 | 41 | 28.77 | 29.93 | ..... | 59.3 | +.3 | 86 | 24 | 71 | 30 | 9 | 47 | 42 | 51 | ... | 5.25 | +1.5 | 17 | ... | nw. | ... | ... | ... | 3 | 15 | 12 | ..... | .0 | .0 | 6 |
| Portland, Maine [1] | 103 | 5 | 36 | 29.80 | 29.92 | −.03 | 64.7 | ..... | 94 | 25 | 76 | 42 | 8 | 53 | 34 | 55 | 74 | 2.42 | −.9 | 16 | 7.7 | s. | 25 | ne. | 16 | 14 | 12 | 4 | 4.5 | .0 | .0 | 11 |
| Concord [2] | 289 | 4 | 45 | 29.62 | 29.94 | −.02 | 67.4 | +4.5 | 95 | 28 | 81 | 39 | 9 | 54 | 44 | 56 | 69 | 2.35 | −.8 | 11 | 6.4 | nw. | 33 | nw. | 20 | 12 | 14 | 4 | 4.7 | .0 | .0 | 9 |
| Burlington [2] | 403 | 11 | 48 | ..... | 29.90 | −.06 | 67.2 | +1.5 | 91 | 25 | 78 | 43 | 8 | 57 | ... | 57 | 70 | 4.12 | +.7 | 11 | 8.4 | s. | 31 | s. | 13 | 7 | 12 | 11 | ..... | .0 | .0 | 8 |
| Northfield | 876 | 12 | 60 | 29.00 | ..... | ..... | 64.6 | +3.3 | 89 | 25 | 77 | 37 | 9 | 53 | 42 | ... | ... | 4.47 | +1.3 | 15 | 6.9 | sw. | 26 | se. | 17 | 7 | 9 | 14 | 6.1 | .0 | .0 | 9 |
| Boston [1] | 124 | 33 | 62 | 29.79 | 29.93 | −.03 | 71.2 | ..... | 97 | 25 | 81 | 49 | 8 | 61 | 32 | 58 | 66 | 1.49 | −1.4 | 11 | 11.1 | sw. | 27 | ne. | 16 | 6 | 16 | 8 | 6.1 | .0 | .0 | 5 |
| Nantucket | 12 | 10 | 63 | 29.94 | 29.96 | −.02 | 64.8 | +3.8 | 88 | 26 | 73 | 49 | 1 | 57 | 27 | 59 | 83 | 1.33 | −1.3 | 5 | 11.1 | sw. | 26 | ne. | 7 | 7 | 17 | 6 | 5.4 | .0 | .0 | 2 |
| Block Island | 26 | 11 | 46 | 29.93 | 29.96 | −.01 | 65.4 | +3.6 | 88 | 26 | 73 | 49 | 8 | 58 | 27 | 60 | 85 | 1.59 | −1.0 | 7 | 13.6 | sw. | 31 | sw. | 28 | 21 | 5 | 4 | 2.7 | .0 | .0 | 4 |
| Providence [2] | 159 | 46 | 60 | 29.78 | 29.97 | .00 | 72.2 | +3.9 | 98 | 25 | 84 | 49 | 8 | 61 | 31 | 60 | 71 | 1.88 | −.8 | 9 | 8.9 | sw. | 29 | sw. | 15 | 5 | 19 | 6 | 5.4 | .0 | .0 | 4 |
| Hartford [1] | 159 | 5 | 44 | 29.78 | 29.95 | −.02 | 72.3 | ..... | 96 | 26 | 83 | 50 | 8 | 61 | 31 | 62 | 73 | 3.48 | +.4 | 11 | 8.4 | sw. | 28 | ne. | 13 | 3 | 18 | 9 | 6.2 | .0 | .0 | 7 |
| New Haven [2] | 107 | 74 | 153 | 29.84 | 29.97 | .00 | 72.8 | +6.2 | 97 | 25 | 82 | 51 | 8 | 63 | 27 | 63 | 80 | 3.79 | +.7 | 9 | 8.1 | s. | 26 | n. | 13 | 10 | 12 | 8 | 5.3 | .0 | .0 | 8 |
| **Middle Atlantic States** | | | | | | | **76.5** | **+5.9** | | | | | | | | | **74** | **3.18** | **−0.4** | | | | | | | | | | **5.5** | | | |
| Albany [1] | 97 | 26 | 40 | 29.82 | 29.94 | −.03 | 72.0 | +5.3 | 97 | 26 | 82 | 51 | 7 | 62 | 37 | 61 | 71 | 2.84 | −.2 | 11 | 8.5 | s. | 34 | nw. | 26 | 5 | 14 | 11 | 6.4 | .0 | .0 | 9 |
| Binghamton | 871 | 57 | 79 | 29.48 | 29.98 | +.01 | 71.9 | +6.3 | 94 | 25 | 83 | 50 | 12 | 61 | 34 | 62 | 80 | 3.29 | −.1 | 10 | 5.4 | w. | 20 | w. | 1 | 14 | 10 | 6 | 4.7 | .0 | .0 | 8 |
| New York | 314 | 415 | 454 | 29.63 | 29.97 | −.01 | 74.4 | +5.6 | 96 | 25 | 82 | 55 | 8 | 66 | 23 | 62 | 71 | 3.17 | −.2 | 7 | 13.7 | w. | 39 | w. | 13 | 10 | 13 | 7 | 5.4 | .0 | .0 | 8 |
| Harrisburg [1] | 374 | 30 | 49 | 29.58 | 29.99 | .00 | 76.8 | +6.5 | 98 | 25 | 87 | 54 | 30 | 66 | 31 | 65 | 70 | 2.32 | −1.3 | 7 | 6.8 | w. | 31 | ne. | 27 | 3 | 16 | 11 | 6.4 | .0 | .0 | 6 |
| Philadelphia [2] | 114 | 174 | 367 | 29.86 | 29.99 | +.01 | 76.8 | +5.4 | 97 | 26 | 87 | 56 | 9 | 67 | 26 | 65 | 72 | 4.03 | +.8 | 8 | 8.3 | sw. | 29 | nw. | 1 | 5 | 16 | 9 | 5.9 | .0 | .0 | 11 |
| Reading | 323 | 47 | 306 | 29.63 | 29.98 | ..... | 76.6 | +6.2 | 99 | 25 | 86 | 57 | 30 | 67 | 28 | ... | ... | 2.43 | −1.1 | 8 | 9.5 | sw. | 37 | nw. | 17 | 7 | 14 | 9 | 5.7 | .0 | .0 | 8 |
| Scranton | 805 | 72 | 104 | 29.14 | ..... | ..... | 73.2 | +5.4 | 95 | 25 | 83 | 52 | 30 | 63 | 30 | ... | ... | 3.11 | −.6 | 11 | 6.3 | sw. | 26 | nw. | 22 | 4 | 21 | 5 | 5.6 | .0 | .0 | 8 |
| Atlantic City | 52 | 37 | 172 | 29.93 | 29.99 | +.01 | 73.4 | +6.8 | 96 | 4 | 80 | 57 | 10 | 66 | 24 | 65 | 79 | 2.75 | −.3 | 10 | 14.6 | s. | 32 | ne. | 14 | 9 | 15 | 6 | 5.1 | .0 | .0 | 8 |
| Trenton | 160 | 89 | 107 | 29.78 | 29.98 | ..... | 75.5 | +6.0 | 96 | 25 | 85 | 55 | 10 | 66 | 27 | 64 | 71 | 3.31 | +.2 | 8 | 6.9 | sw. | 29 | nw. | 29 | 5 | 14 | 11 | 6.2 | .0 | .0 | 9 |
| Baltimore [2] | 124 | 100 | 215 | 29.86 | 30.00 | +.01 | 79.8 | +7.1 | 97 | 26 | 88 | 60 | 9 | 72 | 22 | 67 | 70 | 1.29 | −2.6 | 6 | 9.7 | sw. | 34 | nw. | 17 | 10 | 14 | 6 | 5.2 | .0 | .0 | 5 |
| Washington [2] | 112 | 56 | 100 | 29.94 | 30.00 | .00 | 79.2 | +7.0 | 95 | 4 | 88 | 60 | 9 | 70 | 26 | 67 | 74 | 2.43 | −1.7 | 11 | 6.5 | s. | 36 | w. | 17 | 8 | 15 | 7 | 5.4 | .0 | .0 | 6 |
| Cape Henry | 18 | 8 | 54 | 29.99 | 30.02 | ..... | 78.8 | +5.9 | 95 | 26 | 87 | 62 | 11 | 71 | 23 | 69 | 77 | 3.93 | .0 | 11 | 9.4 | sw. | 40 | n. | 13 | 10 | 15 | 5 | 4.5 | .0 | .0 | 12 |
| Lynchburg | 686 | 144 | 184 | 29.31 | 30.01 | .00 | 79.4 | +4.8 | 97 | 5 | 90 | 62 | 10 | 69 | 29 | 68 | 73 | 4.48 | +.7 | 13 | 6.3 | sw. | 35 | sw. | 22 | 12 | 11 | 7 | 4.5 | .0 | .0 | 11 |
| Norfolk [2] | 91 | 80 | 125 | 29.93 | 30.04 | +.04 | 80.0 | +5.6 | 98 | 3 | 89 | 64 | 11 | 71 | 23 | 70 | 78 | 4.26 | .0 | 11 | 8.5 | sw. | 35 | w. | 18 | 7 | 15 | 8 | 5.7 | .0 | .0 | 11 |
| Richmond [2] | 144 | 11 | 52 | 29.85 | 30.00 | −.01 | 79.0 | +4.9 | 96 | 4 | 89 | 63 | 10 | 69 | 26 | 69 | 74 | 4.07 | +.2 | 10 | 7.3 | sw. | 30 | nw. | 29 | 8 | 14 | 8 | 5.4 | .0 | .0 | 9 |
| **South Atlantic States** | | | | | | | **81.0** | **+4.5** | | | | | | | | | **77** | **4.88** | **+0.3** | | | | | | | | | | **5.0** | | | |
| Asheville | 2,253 | 89 | 104 | 27.78 | 30.06 | +.05 | 75.6 | +6.9 | 94 | 6 | 87 | 59 | 2 | 64 | 34 | 64 | 77 | 8.28 | +4.4 | 15 | 5.2 | nw. | 26 | se. | 10 | 3 | 13 | 14 | 6.7 | .0 | .0 | 15 |
| Charlotte [2] | 779 | 63 | 86 | 29.22 | 30.04 | +.03 | 81.4 | +5.9 | 102 | 5 | 92 | 67 | 7 | 71 | 30 | 69 | 76 | 7.03 | +2.8 | 14 | 5.8 | sw. | 26 | w. | 6 | 4 | 18 | 8 | 6.0 | .0 | .0 | 19 |
| Greensboro [1] | 886 | 6 | 56 | 29.12 | 30.05 | ..... | 78.2 | ..... | 96 | 5 | 89 | 64 | 10 | 68 | 32 | 69 | 78 | 5.73 | ..... | 12 | 6.6 | s. | 28 | w. | 6 | 7 | 17 | 6 | a.3 | .0 | .0 | 15 |
| Hatteras | 11 | 5 | 50 | 30.02 | 30.04 | +.03 | 79.2 | +3.6 | 92 | 5 | 85 | 67 | 30 | 73 | 18 | 74 | 86 | 1.03 | −3.5 | 4 | 10.0 | sw. | 30 | nw. | 6 | 17 | 9 | 4 | 3.6 | .0 | .0 | 10 |
| Raleigh [1] | 376 | 27 | 69 | 29.64 | 30.04 | +.03 | 80.4 | +4.7 | 102 | 5 | 91 | 63 | 30 | 70 | 28 | 70 | 76 | 8.75 | +4.4 | 10 | 7.5 | sw. | 38 | w. | 17 | 4 | 15 | 11 | 6.2 | .0 | .0 | 10 |
| Wilmington | 72 | 73 | 107 | 29.97 | 30.05 | +.04 | 81.1 | +4.3 | 100 | 5 | 89 | 68 | 11 | 74 | 24 | 72 | 79 | 5.44 | +.3 | 9 | 9.0 | sw. | 31 | sw. | 27 | 10 | 16 | 4 | 4.4 | .0 | .0 | 12 |
| Charleston [2] | 48 | 11 | 92 | 29.99 | 30.04 | +.03 | 82.4 | +3.5 | 99 | 4 | 89 | 68 | 9 | 76 | 24 | 73 | 82 | 2.93 | −1.7 | 10 | 10.6 | s. | 33 | se. | 27 | 17 | 11 | 2 | 3.6 | .0 | .0 | 4 |
| Columbia, S. C. [2] | 347 | 70 | 91 | 29.66 | 30.03 | +.02 | 82.2 | +4.1 | 104 | 5 | 93 | 68 | 7 | 72 | 28 | 71 | 75 | 3.85 | −.3 | 10 | 7.5 | s. | 29 | nw. | 7 | 8 | 18 | 4 | 5.3 | .0 | .0 | 14 |
| Greenville, S. C. [1] | 1,040 | 70 | 78 | 28.96 | 30.03 | ..... | 79.8 | +5.7 | 98 | 6 | 90 | 65 | 9 | 69 | 27 | 68 | 75 | 3.25 | −1.3 | 12 | 7.4 | sw. | 40 | n. | 9 | 6 | 18 | 6 | 5.6 | .0 | .0 | 18 |
| Augusta [2] | 182 | 62 | 77 | 29.83 | 30.03 | +.02 | 82.8 | +4.1 | 102 | 6 | 93 | 67 | 22 | 72 | 29 | 68 | 69 | 3.48 | −1.2 | 14 | 5.7 | s. | 28 | w. | 22 | 9 | 18 | 3 | 4.6 | .0 | .0 | 15 |
| Savannah [2] | 65 | 70 | 152 | 29.97 | 30.04 | +.03 | 83.0 | +4.0 | 102 | 6 | 92 | 71 | 11 | 74 | 26 | 72 | 75 | 3.88 | −1.4 | 13 | 9.3 | sw. | 32 | e. | 27 | 12 | 17 | 1 | 4.0 | .0 | .0 | 7 |
| Jacksonville [2] | 43 | 86 | 110 | 30.00 | 30.05 | +.04 | 82.6 | +2.7 | 100 | 5 | 92 | 70 | 21 | 74 | 24 | 71 | 77 | 5.72 | +.4 | 11 | 6.5 | s. | 21 | s. | 28 | 11 | 11 | 8 | 4.8 | .0 | .0 | 8 |
| **Florida Peninsula** | | | | | | | **81.6** | **+1.1** | | | | | | | | | **78** | **7.62** | **+1.5** | | | | | | | | | | **5.1** | | | |
| Key West [2] | 21 | 10 | 64 | 30.01 | 30.04 | +.05 | 82.9 | +1.0 | 89 | 21 | 87 | 73 | 25 | 79 | 15 | 73 | 77 | 4.64 | +.4 | 10 | 9.3 | e. | 26 | sw. | 25 | 10 | 13 | 7 | 5.1 | .0 | .0 | 7 |
| Miami [2] | 25 | 124 | 168 | 30.02 | 30.06 | +.06 | 79.6 | +.4 | 85 | 11 | 83 | 70 | 28 | 76 | 12 | 72 | 77 | 5.68 | −1.2 | 12 | 10.4 | se. | 33 | s. | 24 | 14 | 10 | 6 | 4.9 | .0 | .0 | 4 |
| Tampa [1] | 35 | 5 | 61 | 30.01 | 30.05 | +.04 | 82.2 | +2.0 | 96 | 5 | 90 | 71 | 23 | 74 | 21 | 72 | 80 | 12.54 | +5.3 | 15 | 8.7 | s. | 44 | sw. | 6 | 6 | 18 | 6 | 5.4 | .0 | .0 | 23 |
| **East Gulf States** | | | | | | | **82.0** | **+3.3** | | | | | | | | | **76** | **3.26** | **−1.4** | | | | | | | | | | **5.3** | | | |
| Atlanta [1] | 1,173 | 5 | 72 | 28.83 | 30.03 | +.02 | 81.2 | +4.5 | 100 | 6 | 92 | 67 | 8 | 70 | 27 | 68 | 73 | 6.63 | +2.7 | 10 | 7.0 | nw. | 32 | s. | 29 | 5 | 17 | 8 | 5.9 | .0 | .0 | 14 |
| Macon [2] | 370 | 79 | 87 | 29.64 | 30.03 | +.02 | 81.4 | +2.5 | 100 | 6 | 92 | 67 | 20 | 71 | 28 | 70 | 75 | 3.00 | −1.0 | 14 | 5.7 | s. | 30 | sw. | 7 | 7 | 22 | 1 | 4.5 | .0 | .0 | 15 |
| Thomasville | 273 | 49 | 58 | ..... | ..... | ..... | 81.7 | +2.2 | 100 | 6 | 92 | 68 | 18 | 71 | 27 | ... | ... | 2.77 | −2.7 | 12 | ... | ... | ... | ... | ... | 1 | 17 | 12 | ..... | .0 | .0 | 17 |
| Apalachicola | 35 | 11 | 51 | 29.99 | 30.03 | ..... | 81.6 | +1.8 | 95 | 6 | 88 | 73 | 24 | 75 | 20 | 73 | 78 | 3.17 | −2.4 | 9 | 6.6 | s. | 21 | e. | 6 | 4 | 16 | 10 | 5.9 | .0 | .0 | 20 |
| Pensacola | 56 | 54 | 79 | 29.96 | 30.02 | +.03 | 81.9 | +2.6 | 94 | 16 | 89 | 71 | 17 | 75 | 23 | 73 | 78 | 2.72 | −2.0 | 10 | 6.0 | sw. | 26 | nw. | 17 | 7 | 14 | 9 | 5.9 | .0 | .0 | 16 |
| Anniston | 741 | 9 | ... | ... | ... | ... | 80.4 | +5.4 | 98 | 16 | 93 | 65 | 19 | 68 | 29 | ... | ... | 1.47 | −2.6 | 8 | ... | se. | ... | ... | ... | 14 | 14 | 2 | ..... | .0 | .0 | 9 |
| Birmingham [2] | 700 | 11 | 48 | 29.30 | 30.03 | +.04 | 82.6 | +4.7 | 98 | 17 | 93 | 68 | 22 | 72 | 26 | 69 | 72 | 1.31 | −3.2 | 11 | 5.5 | s. | 21 | se. | 11 | 6 | 21 | 3 | 5.0 | .0 | .0 | 20 |
| Mobile [2] | 57 | 6 | 30 | 29.97 | 30.03 | +.04 | 82.5 | +2.2 | 95 | 16 | 91 | 71 | 9 | 74 | 22 | 72 | 82 | 5.26 | −.2 | 13 | 5.5 | s. | 24 | e. | 24 | 6 | 18 | 6 | 5.7 | .0 | .0 | 18 |
| Montgomery [2] | 218 | 92 | 105 | 29.79 | 30.02 | +.02 | 82.9 | +3.3 | 98 | 16 | 93 | 68 | 28 | 73 | 28 | 70 | 71 | 3.29 | −.5 | 11 | 5.8 | e. | 21 | e. | 19 | 13 | 14 | 3 | 4.5 | .0 | .0 | 12 |
| Meridian [2] | 375 | 67 | 92 | 29.63 | 30.02 | +.04 | 83.0 | +4.9 | 98 | 17 | 94 | 68 | 11 | 72 | 27 | 71 | 75 | 2.88 | −1.7 | 12 | 5.3 | sw. | 29 | s. | 13 | 9 | 19 | 2 | 4.6 | .0 | .0 | 13 |
| Vicksburg [2] | 247 | 82 | 102 | 29.74 | 30.00 | +.03 | 82.2 | +3.2 | 95 | 20 | 91 | 68 | 30 | 73 | 23 | 71 | 79 | 2.44 | −1.6 | 7 | 7.0 | s. | 26 | ne. | 25 | 7 | 19 | 4 | 5.2 | .0 | .0 | 11 |
| New Orleans [2] | 53 | 76 | 84 | 29.96 | 30.02 | +.04 | 82.8 | +2.2 | 96 | 9 | 91 | 68 | 9 | 74 | 28 | 73 | 78 | 4.22 | −1.7 | 13 | 5.7 | se. | 17 | ne. | 20 | 7 | 19 | 4 | 5.4 | .0 | .0 | 17 |
| **West Gulf States** | | | | | | | **82.0** | **+2.0** | | | | | | | | | **75** | **2.13** | **−1.6** | | | | | | | | | | **5.6** | | | |
| Shreveport [1] | 249 | 5 | 64 | 29.72 | 29.97 | +.01 | 83.6 | +3.2 | 97 | 21 | 93 | 68 | 30 | 74 | 25 | 71 | 72 | .87 | −2.6 | 3 | 8.2 | s. | 29 | s. | 2 | 5 | 21 | 4 | 5.3 | .0 | .0 | 13 |
| Bentonville | 1,303 | 12 | 51 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Fort Smith | 463 | 57 | 82 | 29.47 | 29.94 | .00 | 80.8 | +3.3 | 95 | 27 | 90 | 61 | 30 | 72 | 25 | 69 | 70 | 4.86 | +1.1 | 8 | 6.9 | e. | 25 | s. | 6 | 8 | 13 | 9 | 5.7 | .0 | .0 | 11 |
| Little Rock [1] | 357 | 94 | 102 | 29.62 | 29.99 | +.03 | 81.6 | +4.2 | 98 | 21 | 91 | 61 | 30 | 72 | 26 | 70 | 75 | 2.81 | −1.0 | 7 | 7.2 | s. | 24 | s. | 2 | 6 | 18 | 6 | 5.6 | .0 | .0 | 13 |
| Austin [1] | 605 | 11 | 41 | 29.32 | 29.94 | ..... | 81.1 | −.1 | 99 | 28 | 90 | 70 | 13 | 72 | 26 | 71 | 77 | 1.27 | −1.2 | 10 | 9.0 | s. | 30 | ne. | 29 | 3 | 18 | 9 | 6.2 | .0 | .0 | 5 |
| Brownsville [2] | 57 | 88 | 96 | 29.85 | 29.90 | ..... | 83.5 | +1.1 | 94 | 27 | 91 | 72 | 30 | 76 | 21 | 73 | 79 | .27 | −2.9 | 1 | 13.0 | se. | 31 | se. | 3 | 5 | 17 | 8 | 6.0 | .0 | .0 | 0 |
| Corpu Christi [1] | 20 | 11 | 78 | 29.92 | 29.94 | +.03 | 81.4 | +1.9 | 93 | 29 | 89 | 72 | 10 | 74 | 20 | 74 | 84 | .36 | ..... | 4 | 11.6 | se. | 30 | se. | 3 | 14 | 7 | 9 | 5.0 | .0 | .0 | 2 |
| Dallas [1] | 512 | 6 | 46 | 29.40 | 29.93 | ..... | 82.6 | ..... | 100 | 28 | 92 | 68 | 7 | 74 | 23 | 69 | 68 | 1.65 | −2.3 | 6 | 12.0 | s. | 35 | s. | 2 | 7 | 15 | 8 | 5.4 | .0 | .0 | 7 |
| Fort Worth [1] | 679 | 55 | 56 | 29.24 | 29.93 | +.01 | 82.4 | +2.5 | 102 | 28 | 92 | 67 | 7 | 73 | 26 | 68 | 69 | 3.93 | −.6 | 6 | 11.2 | s. | 34 | sw. | 2 | 9 | 13 | 8 | 5.5 | .0 | .0 | 7 |
| Galveston [2] | 54 | 106 | 114 | 29.92 | 29.97 | +.02 | 82.2 | +1.5 | 90 | 18 | 86 | 72 | 29 | 78 | 17 | 75 | 81 | 2.62 | −1.8 | 7 | 10.6 | s. | 27 | se. | 3 | 6 | 14 | 10 | 5.8 | .0 | .0 | 5 |
| Houston [2] | 138 | 157 | 190 | 29.83 | 29.97 | ..... | 82.6 | +1.2 | 97 | 28 | 91 | 72 | 13 | 75 | 21 | 72 | 80 | 1.40 | −3.2 | 6 | 9.6 | se. | 25 | se. | 4 | 5 | 19 | 6 | 5.6 | .0 | .0 | 9 |
| Palestine | 510 | 64 | 72 | 29.45 | 29.97 | +.03 | 81.9 | +2.9 | 97 | 28 | 91 | 68 | 30 | 73 | 23 | 70 | 74 | 1.11 | −2.5 | 7 | 7.2 | s. | 21 | s. | 2 | 12 | 15 | 3 | 4.6 | .0 | .0 | 8 |
| Port Arthur | 34 | 59 | 134 | 29.95 | 29.98 | ..... | 83.2 | ..... | 94 | 18 | 90 | 72 | 29 | 77 | 18 | 73 | 76 | 2.85 | −2.0 | 5 | 11.6 | s. | 31 | s. | 12 | 8 | 10 | 12 | 6.0 | .0 | .0 | 10 |
| San Antonio [1] | 693 | 28 | 59 | 29.22 | 29.92 | +.02 | 81.2 | +.2 | 99 | 28 | 90 | 65 | 5 | 72 | 27 | 70 | 75 | 1.91 | −.6 | 5 | 9.2 | se. | 29 | e. | 29 | 5 | 18 | 7 | 6.0 | .0 | .0 | 3 |

See footnotes at end of table.

## CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS—Continued

| District and station | Elevation of instruments: Barometer above sea level | Elevation of instruments: Thermometer above ground | Elevation of instruments: Anemometer above ground | Pressure: Mean station | Pressure: Mean Sea-Level | Pressure: Departure from normal | Temperature of the air: Mean max.+mean min.÷2 | Temperature of the air: Departure from normal | Temperature of the air: Maximum | Temperature of the air: Date | Temperature of the air: Mean maximum | Temperature of the air: Minimum | Temperature of the air: Date | Temperature of the air: Mean minimum | Temperature of the air: Greatest daily range | Mean temperature of the dewpoint | Mean relative humidity | Precipitation: Total | Precipitation: Departure from normal | Precipitation: Days with 0.01 inch or more | Wind: Average hourly velocity | Wind: Prevailing direction | Wind: Maximum velocity: Miles per hour | Wind: Maximum velocity: Direction | Wind: Maximum velocity: Date | Clear days | Partly cloudy days | Cloudy days | Average cloudiness, tenths | Total snowfall | Snow, sleet, and ice on ground at end of month | Number of days with thunderstorms |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Ohio Valley and Tennessee** | *Ft.* | *Ft.* | *Ft.* | *In.* | *In.* | *In.* | °F. | °F. | °F. | | °F. | °F. | | °F. | °F. | °F. | % | *In.* | *In.* | | *Miles* | | | | | | | | *0–10* | *In.* | *In.* | |
| | | | | | | | 77.1 | +5.2 | | | | | | | | | 75 | 3.30 | −0.6 | | | | | | | | | | | 5.2 | | | |
| Chattanooga [1] | 762 | 21 | 54 | 29.23 | 30.02 | +.02 | 80.2 | +7.0 | 96 | 6 | 93 | 62 | 19 | 68 | 32 | 68 | 75 | 2.67 | −1.5 | 8 | 5.0 | s. | 39 | nw. | 21 | 10 | 18 | 2 | 5.0 | .0 | .0 | 19 |
| Knoxville [2] | 995 | 66 | 84 | 29.00 | 30.04 | +.04 | 79.9 | +5.9 | 98 | 6 | 92 | 63 | 30 | 68 | 31 | 67 | 74 | 3.55 | −.6 | 14 | 6.3 | sw. | 35 | ne. | 23 | 12 | 16 | 2 | 4.2 | .0 | .0 | 18 |
| Memphis [2] | 399 | 78 | 86 | 29.58 | 29.99 | +.02 | 81.6 | +4.0 | 97 | 21 | 91 | 61 | 30 | 72 | 30 | 69 | 72 | 2.02 | −1.5 | 11 | 7.0 | sw. | 25 | sw. | 2 | 11 | 17 | 2 | 4.4 | .0 | .0 | 15 |
| Nashville [1] | 546 | 5 | 72 | 29.44 | 30.01 | +.02 | 81.0 | ..... | 97 | 26 | 92 | 60 | 30 | 70 | 30 | 68 | 70 | 1.61 | −2.4 | 7 | 7.0 | s. | 29 | n. | 15 | 12 | 16 | 2 | 4.0 | .0 | .0 | 11 |
| Lexington | 989 | 6 | ..... | 29.00 | ..... | ..... | 78.0 | +5.8 | 96 | 27 | 90 | 50 | 30 | 66 | 32 | ..... | ..... | 3.09 | ..... | 14 | ..... | s. | ..... | ..... | ..... | 11 | 19 | 0 | .0 | .0 | .0 | 13 |
| Louisville [2] | 525 | 106 | 120 | 29.46 | 30.02 | +.04 | 77.6 | +2.9 | 92 | 23 | 86 | 53 | 30 | 69 | 24 | 67 | 76 | 3.81 | .0 | 10 | 7.7 | s. | 41 | w. | 28 | 11 | 14 | 5 | 4.6 | .0 | .0 | 7 |
| Evansville [1] | 431 | 5 | 38 | 29.55 | 30.01 | +.04 | 77.2 | +5.3 | 93 | 12 | 87 | 54 | 30 | 68 | 28 | 68 | 77 | 9.30 | +5.3 | 12 | 6.7 | s. | 28 | nw. | 6 | 8 | 15 | 7 | 5.5 | .0 | .0 | 12 |
| Indianapolis [1] | 823 | 98 | 129 | 29.13 | 30.00 | +.03 | 74.8 | +4.9 | 92 | 24 | 85 | 46 | 30 | 65 | 30 | 66 | 78 | 3.29 | ..... | 19 | 9.2 | sw. | 37 | nw. | 15 | 5 | 19 | 6 | 5.8 | .0 | .0 | 11 |
| Terre Haute [2] | 575 | 68 | 149 | 29.40 | 30.00 | ..... | 77.7 | ..... | 96 | 24 | 87 | 50 | 30 | 68 | 24 | 67 | 77 | 1.36 | −2.6 | 7 | 8.4 | sw. | 27 | w. | 15 | 6 | 14 | 10 | 6.2 | .0 | .0 | 11 |
| Cincinnati [2] | 627 | 11 | 51 | 29.34 | 30.00 | +.01 | 77.0 | +5.8 | 93 | 26 | 87 | 48 | 30 | 67 | 25 | 67 | 76 | 3.50 | −.2 | 12 | 5.9 | sw. | 18 | sw. | 16 | 8 | 16 | 6 | 5.4 | .0 | .0 | 12 |
| Columbus [2] | 822 | 90 | 210 | 29.15 | 30.00 | +.01 | 76.2 | +5.3 | 96 | 25 | 86 | 48 | 30 | 67 | 29 | 65 | 74 | 4.19 | +9.0 | 11 | 8.5 | s. | 36 | nw. | 15 | 6 | 15 | 9 | 5.6 | .0 | .0 | 13 |
| Dayton [2] | 900 | 186 | 123 | 29.06 | 30.01 | ..... | 75.5 | +4.1 | 94 | 27 | 86 | 46 | 30 | 65 | 28 | 64 | 74 | 1.52 | ..... | 19 | 9.5 | sw. | 42 | nw. | 28 | 5 | 14 | 11 | 6.1 | .0 | .0 | 13 |
| Elkins [2] | 1,947 | 61 | 78 | 28.04 | 30.04 | +.04 | 72.4 | +5.5 | 90 | 28 | 83 | 49 | 30 | 62 | 29 | 64 | 81 | 3.37 | −1.7 | 13 | 4.9 | w. | 21 | w. | 28 | 3 | 20 | 7 | 6.1 | .0 | .0 | 13 |
| Parkersburg | 637 | 77 | 84 | 29.34 | 30.02 | +.02 | 77.1 | +5.7 | 94 | 27 | 88 | 53 | 30 | 67 | 28 | 66 | 73 | 2.39 | −1.6 | 10 | 4.6 | se. | 31 | nw. | 28 | 11 | 14 | 5 | 4.7 | .0 | .0 | 12 |
| Pittsburgh [1] | 842 | 39 | 54 | 29.12 | 30.01 | +.02 | 74.6 | +5.1 | 93 | 24 | 84 | 52 | 30 | 65 | 27 | 62 | 70 | 1.89 | −1.9 | 8 | 9.3 | sw. | 29 | nw. | 28 | 7 | 19 | 5 | 5.0 | .0 | .0 | 6 |
| **Lower Lake Region** | | | | | | | 70.8 | +4.6 | | | | | | | | | 73 | 3.14 | −0.2 | | | | | | | | | | 5.1 | | | |
| Buffalo [2] | 768 | 243 | 280 | 29.16 | 29.98 | +0.01 | 65.7 | +1.3 | 86 | 24 | 73 | 45 | 7 | 58 | 27 | 59 | 75 | 2.77 | 0.0 | 8 | 13.7 | sw. | 42 | w. | 1 | 10 | 13 | 7 | 4.8 | .0 | .0 | 8 |
| Canton | 448 | 10 | 61 | 29.44 | 29.91 | ..... | 67.0 | +1.9 | 88 | 25 | 78 | 41 | 6 | 56 | 34 | 57 | 72 | 4.01 | +.7 | 12 | 7.9 | w. | 28 | nw. | 15 | 3 | 15 | 12 | 6.5 | .0 | .0 | 8 |
| Ithaca | 836 | 77 | 100 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Oswego | 335 | 71 | 85 | 29.58 | 29.95 | −.02 | 66.4 | +1.6 | 92 | 26 | 76 | 45 | 7 | 57 | 31 | 58 | 74 | 1.87 | −1.4 | 10 | 7.2 | w. | 19 | w. | 13 | 9 | 17 | 4 | 4.7 | .0 | .0 | 6 |
| Rochester | 523 | 5 | 69 | 29.41 | 29.97 | .00 | 70.8 | +5.7 | 94 | 25 | 81 | 46 | 8 | 60 | 35 | 60 | 70 | 4.22 | +1.2 | 11 | 9.3 | w. | 35 | w. | 17 | 6 | 14 | 10 | 5.6 | .0 | .0 | 7 |
| Syracuse [1] | 596 | 5 | 51 | 29.32 | 29.95 | −.02 | 70.6 | +6.1 | 94 | 26 | 81 | 47 | 8 | 60 | 36 | 61 | 72 | 4.63 | +.8 | 13 | 9.3 | sw. | 43 | w. | 17 | 5 | 12 | 13 | 6.5 | .0 | .0 | 8 |
| Erie [1] | 714 | 57 | 81 | 29.24 | 30.00 | +.02 | 71.2 | +5.0 | 90 | 12 | 79 | 50 | 7 | 64 | 27 | 61 | 76 | 1.65 | −1.7 | 8 | 7.4 | w. | 26 | w. | 1 | 13 | 13 | 4 | 3.9 | .0 | .0 | 5 |
| Cleveland [1] | 762 | 27 | 54 | 29.19 | 30.00 | +.02 | 73.7 | +6.0 | 97 | 25 | 84 | 51 | 30 | 63 | 35 | 62 | 70 | 4.02 | +.9 | 8 | 9.5 | sw. | 38 | nw. | 27 | 6 | 16 | 8 | 5.4 | .0 | .0 | 7 |
| Sandusky | 629 | 5 | 67 | ..... | ..... | ..... | 74.2 | +5.4 | 97 | 27 | 84 | 52 | 30 | 65 | 30 | ..... | ..... | 5.41 | +1.9 | 10 | 8.4 | sw. | 31 | nw. | 1 | 8 | 16 | 6 | 5.1 | .0 | .0 | 8 |
| Toledo [2] | 628 | 79 | 87 | 29.32 | 30.00 | +.03 | 73.2 | +4.5 | 95 | 25 | 84 | 42 | 30 | 62 | 36 | 63 | 73 | 2.18 | −1.2 | 9 | 10.6 | sw. | 38 | nw. | 1 | 23 | 6 | 1 | 2.6 | .0 | .0 | 12 |
| Fort Wayne [1] | 857 | 69 | 84 | 29.09 | 29.99 | ..... | 73.6 | +6.2 | 94 | 25 | 84 | 42 | 30 | 63 | 31 | 64 | 74 | 2.15 | −1.4 | 9 | 7.5 | sw. | 39 | w. | 15 | 6 | 16 | 8 | 5.7 | .0 | .0 | 10 |
| Detroit [1] | 730 | 5 | 78 | 29.22 | 29.99 | +.02 | 72.8 | +6.6 | 95 | 26 | 82 | 47 | 30 | 63 | 28 | 61 | 70 | 1.65 | −1.9 | 9 | 9.3 | sw. | 35 | s. | 15 | 6 | 18 | 6 | 5.8 | .0 | .0 | 6 |
| **Upper Lake Region** | | | | | | | 65.1 | +2.7 | | | | | | | | | 78 | 4.28 | +0.9 | | | | | | | | | | 6.5 | | | |
| Alpena | 609 | 5 | 89 | 29.29 | 29.96 | .00 | 65.0 | +4.6 | 93 | 19 | 75 | 41 | 30 | 55 | 35 | 56 | 76 | 3.20 | −.1 | 15 | 9.3 | nw. | 32 | sw. | 4 | 3 | 15 | 12 | 6.7 | .0 | .0 | 6 |
| Escanaba | 612 | 51 | 72 | 29.28 | 29.93 | −.01 | 62.6 | +1.9 | 87 | 18 | 71 | 40 | 8 | 54 | 30 | 56 | 82 | 5.42 | +2.2 | 18 | 9.3 | s. | 29 | n. | 19 | 8 | 11 | 11 | 6.3 | .0 | .0 | 10 |
| Grand Rapids [2] | 707 | 70 | 244 | 29.23 | 29.98 | +.01 | 71.5 | +3.7 | 94 | 27 | 81 | 44 | 30 | 62 | 28 | 61 | 74 | 2.48 | −1.0 | 11 | 10.5 | sw. | 37 | sw. | 12 | 8 | 14 | 8 | 5.5 | .0 | .0 | 7 |
| Lansing [2] | 878 | 5 | 90 | 29.06 | 30.00 | ..... | 69.6 | +3.2 | 90 | 25 | 79 | 41 | 30 | 60 | 27 | 61 | 74 | 3.85 | +.3 | 10 | 7.4 | sw. | 30 | n. | 21 | 10 | 13 | 7 | 5.3 | .0 | .0 | 11 |
| Ludington | 637 | 60 | 66 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Marquette | 734 | 44 | 73 | 29.14 | 29.94 | .00 | 58.7 | −.2 | 92 | 24 | 69 | 36 | 6 | 48 | 37 | 52 | 78 | 7.82 | +4.6 | 18 | 6.9 | nw. | 26 | sw. | 12 | 3 | 14 | 13 | 6.8 | .0 | .0 | 12 |
| Sault Sainte Marie [1] | 614 | 11 | 43 | 29.28 | 29.95 | −.01 | 58.4 | +.9 | 85 | 24 | 69 | 35 | 8 | 48 | 36 | 54 | 86 | 6.51 | +3.8 | 17 | 9.4 | w. | 48 | w. | 19 | 3 | 12 | 15 | 7.1 | .0 | .0 | 12 |
| Chicago | 673 | 19 | 38 | 29.26 | 29.98 | +.02 | 72.2 | +4.1 | 97 | 27 | 83 | 45 | 30 | 62 | 30 | 61 | 72 | 1.47 | −2.0 | 9 | 9.0 | sw. | 31 | sw. | 3 | 3 | 13 | 14 | 7.0 | .0 | .0 | 9 |
| Green Bay | 617 | 109 | 141 | 29.28 | 29.96 | +.01 | 67.8 | +2.9 | 93 | 21 | 77 | 44 | 30 | 59 | 30 | 62 | 81 | 4.04 | +.3 | 13 | 10.2 | s. | 33 | sw. | 12 | 6 | 15 | 9 | 6.2 | .0 | .0 | 11 |
| Milwaukee [1] | 681 | 33 | 66 | 29.24 | 29.96 | +.01 | 67.0 | +4.9 | 94 | 26 | 78 | 42 | 5 | 56 | 38 | 59 | 74 | 2.33 | −1.1 | 12 | 11.0 | sw. | 37 | sw. | 12 | 4 | 14 | 12 | 6.7 | .0 | .0 | 10 |
| Duluth | 1,133 | 5 | 47 | 28.71 | 29.93 | +.01 | 57.8 | +.6 | 87 | 21 | 69 | 36 | 5 | 47 | 37 | 52 | 78 | 5.71 | +1.8 | 18 | 10.9 | ne. | 43 | w. | 24 | 3 | 13 | 14 | 7.0 | .0 | .0 | 7 |
| **North Dakota** | | | | | | | 61.2 | −1.8 | | | | | | | | | 75 | 5.57 | +2.0 | | | | | | | | | | 6.4 | | | |
| Fargo [1] | 940 | 5 | 43 | 28.89 | 29.89 | −.01 | 63.8 | −.6 | 93 | 20 | 74 | 41 | 4 | 54 | 31 | 56 | 70 | 5.64 | +1.6 | 12 | 11.0 | n. | 55 | nw. | 24 | 4 | 13 | 13 | 6.6 | .0 | .0 | 11 |
| Bismarck [1] | 1,677 | 4 | 41 | 28.16 | 29.92 | +.05 | 62.2 | −.7 | 90 | 22 | 73 | 36 | 3 | 52 | 32 | 52 | 74 | 6.44 | +3.1 | 15 | 11.6 | ne. | 49 | nw. | 24 | 8 | 10 | 12 | 6.1 | T | .0 | 9 |
| Devils Lake | 1,478 | 11 | 44 | 28.37 | 29.94 | +.06 | 59.5 | −2.4 | 85 | 18 | 69 | 34 | 5 | 50 | 28 | 51 | 77 | 4.66 | +1.1 | 18 | 8.5 | n. | 34 | ne. | 3 | 3 | 14 | 13 | 7.0 | .0 | .0 | 10 |
| Lemmon, S. Dak. | 2,602 | 4 | 38 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Grand Forks | 832 | 11 | 71 | 29.02 | 29.92 | ..... | 61.8 | ..... | 92 | 18 | 73 | 37 | 29 | 51 | 34 | 54 | ..... | 2.85 | ..... | 9 | ..... | nw. | ..... | ..... | ..... | 3 | 13 | 14 | ..... | .0 | .0 | 4 |
| Williston | 1,878 | 42 | 50 | 27.96 | 29.92 | +.06 | 59.4 | −3.3 | 87 | 22 | 69 | 33 | 3 | 50 | 29 | 48 | 70 | 5.53 | +2.1 | 18 | 7.4 | se. | 27 | nw. | 20 | 5 | 15 | 10 | 6.1 | T | .0 | 11 |
| **Upper Mississippi Valley** | | | | | | | 73.2 | +2.7 | | | | | | | | | 75 | 4.25 | +0.1 | | | | | | | | | | 6.1 | | | |
| Minneapolis-St. Paul, Minn [1] | 919 | 32 | 61 | 28.94 | 29.91 | −.01 | 70.4 | +2.9 | 96 | 26 | 80 | 44 | 7 | 61 | 26 | 61 | 73 | 4.23 | .0 | 13 | 9.8 | sw. | 32 | n. | 14 | 4 | 13 | 13 | 6.5 | .0 | .0 | 11 |
| Springfield, Minn | 1,025 | 4 | 42 | 28.82 | 29.90 | ..... | 70.0 | ..... | 98 | 20 | 80 | 43 | 4 | 60 | 30 | 59 | 71 | 4.68 | ..... | 12 | ..... | nw. | ..... | ..... | ..... | 8 | 9 | 13 | ..... | .0 | .0 | 11 |
| La Crosse [2] | 714 | 11 | 48 | 29.17 | 29.92 | −.01 | 70.0 | +1.7 | 95 | 26 | 79 | 42 | 30 | 61 | 28 | 62 | 76 | 4.37 | +.3 | 16 | 8.6 | s. | 36 | w. | 16 | 5 | 14 | 11 | 6.2 | .0 | .0 | 13 |
| Madison [2] | 974 | 70 | 78 | 28.94 | 29.96 | +.02 | 69.4 | +2.2 | 92 | 26 | 77 | 48 | 30 | 61 | 22 | 62 | 75 | 4.12 | +.4 | 13 | 7.4 | sw. | 25 | ne. | 20 | 2 | 18 | 10 | 6.5 | .0 | .0 | 10 |
| Charles City | 1,015 | 10 | 51 | 28.88 | ..... | ..... | 70.2 | +3.7 | 95 | 27 | 80 | 45 | 30 | 61 | 27 | ..... | ..... | 3.87 | −.8 | 17 | 6.5 | s. | 24 | w. | 1 | 14 | 7 | 9 | 4.8 | .0 | .0 | 9 |
| Davenport [2] | 606 | 66 | 161 | 29.32 | 29.98 | +.04 | 73.2 | +2.7 | 96 | 26 | 82 | 46 | 30 | 64 | 26 | 64 | 74 | 4.55 | ..... | 10 | 9.2 | sw. | 29 | sw. | 1 | 1 | 13 | 16 | 7.1 | .0 | .0 | 13 |
| Des Moines [2] | 860 | 5 | 99 | 29.02 | 29.92 | .00 | 72.4 | +1.8 | 95 | 26 | 81 | 50 | 30 | 64 | 25 | 63 | 78 | 6.28 | +1.5 | 15 | 9.7 | sw. | 36 | nw. | 27 | 10 | 10 | 10 | 5.5 | .0 | .0 | 15 |
| Dubuque | 699 | 60 | 79 | 29.21 | 29.95 | +.02 | 72.1 | +2.7 | 95 | 26 | 81 | 48 | 30 | 64 | 28 | 62 | 72 | 4.42 | +.1 | 12 | 5.9 | s. | 18 | se. | 11 | 3 | 9 | 18 | 7.2 | .0 | .0 | 13 |
| Burlington, Iowa [1] | 702 | 6 | 35 | 29.22 | 29.97 | +.03 | 73.4 | +1.9 | 95 | 26 | 82 | 46 | 30 | 64 | 28 | 64 | 78 | 4.68 | .0 | 14 | 8.1 | s. | 26 | sw. | 21 | 5 | 12 | 13 | 6.4 | .0 | .0 | 15 |
| Cairo | 357 | 5 | 99 | 29.62 | ..... | ..... | 79.8 | +3.5 | 95 | 27 | 88 | 59 | 30 | 71 | 22 | ..... | ..... | 2.69 | −1.1 | 10 | 7.3 | sw. | 26 | sw. | 2 | 6 | 19 | 5 | 5.4 | .0 | .0 | 13 |
| Peoria [2] | 609 | 11 | 45 | 29.35 | 29.99 | +.04 | 73.2 | +2.3 | 94 | 25 | 82 | 46 | 30 | 64 | 25 | 64 | 77 | 3.49 | −.3 | 11 | 7.2 | sw. | 29 | nw. | 3 | 9 | 14 | 7 | 5.5 | .0 | .0 | 10 |
| Springfield, Ill [2] | 636 | 5 | 191 | 29.31 | 29.98 | +.03 | 76.8 | +4.6 | 95 | 26 | 86 | 52 | 30 | 68 | 27 | 66 | 80 | 2.78 | −1.3 | 14 | 9.9 | s. | 30 | sw. | 3 | 2 | 15 | 13 | 6.8 | .0 | .0 | 14 |
| St. Louis [2] | 568 | 179 | 303 | 29.40 | 29.99 | +.04 | 77.5 | +2.5 | 94 | 20 | 85 | 55 | 30 | 70 | 25 | 67 | 76 | 5.87 | +2.0 | 11 | 10.6 | sw. | 32 | sw. | 2 | 11 | 12 | 7 | 5.0 | .0 | .0 | 15 |
| **Missouri Valley** | | | | | | | 72.5 | +1.9 | | | | | | | | | 74 | 7.35 | +3.0 | | | | | | | | | | 5.6 | | | |
| Columbia, Mo. [2] | 784 | 6 | 66 | 29.14 | 29.96 | +.01 | 75.8 | +3.0 | 94 | 20 | 84 | 51 | 30 | 67 | 27 | 67 | 80 | 8.02 | +3.3 | 10 | 6.8 | s. | 24 | nw. | 15 | 7 | 12 | 11 | 5.9 | .0 | .0 | 12 |
| Kansas City [1] | 963 | 38 | 76 | 28.93 | 29.92 | .00 | 76.6 | ..... | 97 | 25 | 85 | 55 | 30 | 68 | 24 | 65 | 71 | 7.66 | +3.0 | 12 | 11.6 | s. | 40 | s. | 2 | 5 | 11 | 14 | 6.1 | .0 | .0 | 10 |
| St. Joseph [2] | 967 | 11 | 49 | 28.91 | 29.91 | ..... | 75.1 | +1.4 | 96 | 26 | 84 | 52 | 4 | 66 | 26 | 65 | 74 | 15.71 | +10.8 | 14 | 8.6 | s. | 26 | e. | 7 | 16 | 10 | 4 | 3.8 | .0 | .0 | 9 |
| Springfield, Mo. [2] | 1,324 | 5 | 60 | 28.61 | 29.98 | +.03 | 74.6 | +2.9 | 89 | 26 | 83 | 50 | 30 | 66 | 23 | 67 | 82 | 4.70 | .0 | 12 | 8.9 | s. | 31 | s. | 3 | 7 | 14 | 9 | 5.7 | .0 | .0 | 16 |
| Topeka | 987 | 65 | 87 | 28.89 | 29.92 | ..... | 76.7 | +3.3 | 97 | 27 | 86 | 54 | 30 | 67 | 27 | 65 | 74 | 11.46 | +6.8 | 13 | 9.8 | s. | 34 | s. | 2 | 8 | 8 | 14 | 5.6 | .0 | .0 | 11 |
| Lincoln [2] | 1,189 | 11 | 81 | 28.66 | 29.89 | −.01 | 73.0 | +1.6 | 100 | 26 | 83 | 49 | 4 | 63 | 31 | 61 | 70 | 4.96 | +.6 | 13 | 9.7 | s. | 35 | nw. | 27 | 11 | 9 | 10 | 5.4 | .0 | .0 | 8 |
| Omaha [1] | 1,105 | 31 | 44 | 28.76 | 29.91 | .00 | 72.8 | +2.1 | 99 | 27 | 82 | 50 | 4 | 64 | 29 | 63 | 73 | 6.30 | +1.7 | 17 | 11.8 | s. | 47 | w. | 14 | 9 | 9 | 12 | 5.6 | .0 | .0 | 14 |
| Valentine | 2,598 | 46 | 54 | 27.25 | 29.91 | +.05 | 66.6 | −.3 | 99 | 19 | 78 | 38 | 4 | 55 | 37 | 51 | 64 | 4.34 | +1.5 | 12 | 9.3 | se. | 42 | sw. | 13 | 7 | 10 | 13 | 6.1 | .0 | .0 | 13 |
| Sioux City [1] | 1,138 | 5 | 27 | 28.72 | 29.90 | .00 | 70.7 | +1.9 | 100 | 26 | 81 | 45 | 4 | 60 | 33 | 61 | 76 | 4.91 | +.9 | 11 | 11.1 | s. | 34 | nw. | 27 | 9 | 10 | 11 | 5.5 | .0 | .0 | 11 |
| Huron [1] | 1,301 | 5 | 41 | 28.53 | 29.89 | +.01 | 67.4 | +1.2 | 99 | 20 | 78 | 41 | 4 | 56 | 33 | 58 | 78 | 5.47 | +1.7 | 12 | 12.3 | se. | 45 | nw. | 27 | 7 | 10 | 13 | 6.1 | .0 | .0 | 11 |
| **Northern Slope** | | | | | | | 60.0 | −2.3 | | | | | | | | | 66 | 3.24 | +1.0 | | | | | | | | | | 6.3 | | | |
| Billings [1] | 3,570 | 18 | 39 | 26.28 | 29.88 | ..... | 60.4 | −3.5 | 89 | 22 | 71 | 32 | 3 | 50 | 34 | 46 | 64 | 3.28 | ..... | 13 | 10.8 | n. | 35 | ne. | 22 | 3 | 15 | 12 | 6.5 | T | .0 | 8 |
| Havre | 2,507 | 11 | 67 | 27.34 | 29.94 | +.09 | 58.9 | −3.1 | 81 | 29 | 70 | 38 | 6 | 48 | 34 | 45 | 67 | 5.17 | +2.3 | 16 | 8.5 | e. | 29 | sw. | 22 | 3 | 13 | 14 | 6.9 | .0 | .0 | 10 |
| Helena [1] | 4,124 | 5 | 35 | 25.78 | 29.94 | +.06 | 56.2 | −3.0 | 81 | 17 | 68 | 33 | 2 | 45 | 35 | 42 | 66 | 2.49 | +.4 | 13 | 9.6 | w. | 34 | w. | 9 | 4 | 12 | 14 | 6.9 | T | .0 | 8 |
| Missoula [2] | 3,205 | 80 | 91 | 26.63 | 29.98 | ..... | 56.2 | −3.8 | 86 | 29 | 68 | 38 | 23 | 45 | 37 | 43 | 70 | 2.70 | +.8 | 14 | 6.3 | w. | 31 | nw. | 6 | 6 | 10 | 14 | 6.7 | .0 | .0 | 4 |
| Kalispell | 2,973 | 48 | 56 | 26.92 | 29.95 | +.06 | 54.0 | −3.7 | 82 | 29 | 64 | 35 | 5 | 44 | 32 | 42 | 70 | 3.33 | +1.3 | 16 | 5.6 | se. | 20 | w. | 25 | 2 | 9 | 19 | 7.5 | .0 | .0 | 6 |
| Miles City [2] | 2,371 | 48 | 55 | 27.44 | 29.90 | +.05 | 62.6 | −3.4 | 94 | 22 | 75 | 32 | 3 | 51 | 34 | 50 | 70 | 6.12 | ..... | 14 | ..... | e. | ..... | ..... | ..... | 5 | 15 | 10 | 6.4 | T | .0 | 11 |
| Rapid City [2] | 3,259 | 50 | 58 | 26.58 | 29.89 | +.04 | 62.7 | −1.5 | 94 | 22 | 74 | 35 | 4 | 52 | 35 | 52 | 72 | 4.93 | +1.9 | 16 | 13.1 | nw. | 55 | sw. | 26 | 5 | 12 | 13 | 6.4 | T | .0 | 14 |
| Cheyenne [1] | 6,094 | 5 | 39 | 24.02 | 29.87 | +.03 | 60.2 | ..... | 90 | 24 | 74 | 30 | 4 | 47 | 40 | 44 | 65 | 2.34 | +.7 | 13 | 10.1 | w. | 45 | w. | 3 | 5 | 14 | 11 | 6.0 | .0 | .0 | 17 |
| Lander | 5,352 | 60 | 68 | 24.63 | 29.85 | .00 | 59.2 | −1.3 | 89 | 26 | 73 | 32 | 4 | 46 | 42 | 37 | 53 | 1.00 | −.2 | 7 | 5.9 | sw. | 32 | w. | 18 | 10 | 9 | 11 | 5.2 | 4.5 | .0 | 6 |
| Sheridan [2] | 3,790 | 6 | 42 | 26.07 | 29.89 | ..... | 60.8 | −.7 | 93 | 22 | 73 | 32 | 3 | 48 | 38 | 47 | 66 | 3.72 | +1.7 | 13 | 8.8 | nw. | 41 | nw. | 3 | 6 | 14 | 10 | 6.1 | T | .0 | 14 |
| North Platte [2] | 2,821 | 11 | 51 | 27.01 | 29.86 | .00 | 68.8 | +1.3 | 99 | 27 | 81 | 38 | 4 | 57 | 40 | 54 | 67 | 3.45 | +.2 | 11 | 7.8 | se. | 32 | nw. | 12 | 11 | 9 | 10 | 5.2 | .0 | .0 | 12 |

See footnotes at end of table.

## CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS—Continued

| District and station | Elevation of instruments: Barometer above sea level | Elevation of instruments: Thermometer above ground | Elevation of instruments: Anemometer above ground | Pressure: Mean station | Pressure: Mean Sea-Level | Pressure: Departure from normal | Temperature of the air: Mean max.+mean min.÷2 | Temperature of the air: Departure from normal | Temperature of the air: Maximum | Temperature of the air: Date | Temperature of the air: Mean maximum | Temperature of the air: Minimum | Temperature of the air: Date | Temperature of the air: Mean minimum | Temperature of the air: Greatest daily range | Mean temperature of the dewpoint | Mean relative humidity | Precipitation: Total | Precipitation: Departure from normal | Precipitation: Days with 0.01 inch or more | Wind: Average hourly velocity | Wind: Prevailing direction | Wind: Maximum velocity: Miles per hour | Wind: Maximum velocity: Direction | Wind: Maximum velocity: Date | Clear days | Partly cloudy days | Cloudy days | Average cloudiness, tenths | Total snowfall | Snow, sleet, and ice on ground at end of month | Number of days with thunderstorms |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Middle Slope** | *Ft.* | *Ft.* | *Ft.* | *In.* | *In.* | *In.* | *° F.* | *° F.* | *°F.* | | *°F.* | *°F.* | | *°F.* | *°F.* | *°F.* | % | *In.* | *In.* | | *Miles* | | | | | | | | *0–10* | *In.* | *In.* | |
| | | | | | | | 74.5 | +2.0 | | | | | | | | | 64 | 3.31 | 0.0 | | | | | | | | | | | 5.1 | | | |
| Denver [3] | 5,292 | 106 | 113 | 24.72 | 29.85 | +.01 | 66.4 | +.1 | 95 | 23 | 79 | 39 | 4 | 54 | 34 | 43 | 52 | .92 | −.5 | 9 | 7.6 | s. | 29 | ne. | 27 | 10 | 15 | 5 | 4.8 | .0 | .0 | 8 |
| Pueblo [1] | 4,690 | 5 | 36 | 25.24 | 29.81 | −.02 | 69.5 | +.9 | 98 | 22 | 86 | 41 | 3 | 53 | 44 | 43 | 48 | .50 | −.9 | 6 | 9.1 | nw. | 43 | w. | 2 | 14 | 12 | 4 | 4.0 | .0 | .0 | 9 |
| Concordia | 1,392 | 50 | 58 | 28.46 | 29.88 | −.02 | 74.0 | +1.0 | 99 | 24 | 84 | 51 | 4 | 64 | 28 | 62 | 72 | 7.38 | +3.0 | 14 | 8.7 | s. | 29 | nw. | 2 | 10 | 8 | 12 | 5.5 | .0 | .0 | 12 |
| Dodge City [1] | 2,509 | 10 | 86 | 27.32 | 29.84 | −.03 | 75.6 | +3.1 | 101 | 27 | 88 | 52 | 4 | 63 | 41 | 56 | 58 | 4.34 | +1.0 | 5 | 16.1 | s. | 47 | ne. | 16 | 10 | 12 | 8 | 5.3 | .0 | .0 | 10 |
| Wichita [1] | 1,358 | 6 | 64 | 28.50 | 29.89 | −.02 | 76.6 | +2.2 | 96 | 27 | 86 | 54 | 30 | 67 | 27 | 65 | 72 | 3.43 | −1.0 | 10 | 15.4 | s. | 43 | s. | 2 | 9 | 14 | 7 | 5.1 | .0 | .0 | 9 |
| Oklahoma City [3] | 1,214 | 10 | 47 | 28.65 | 29.88 | −.03 | 80.4 | +4.4 | 97 | 24 | 90 | 59 | 30 | 71 | 26 | 67 | 69 | 2.07 | −1.6 | 6 | 9.7 | s. | 26 | s. | 2 | 8 | 16 | 6 | 5.1 | .0 | .0 | 6 |
| Tulsa | 674 | 10 | 61 | 29.22 | 29.92 | ..... | 78.8 | +2.3 | 94 | 27 | 88 | 57 | 30 | 70 | 23 | 69 | 76 | 4.54 | +.1 | 9 | 11.0 | s. | 33 | sw. | 2 | 7 | 11 | 12 | 6.0 | .0 | .0 | 11 |
| **Southern Slope** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | 79.8 | +1.9 | | | | | | | | | 59 | 2.30 | −0.2 | | | | | | | | | | 4.8 | | | |
| Abilene [3] | 1,738 | 10 | 56 | 28.13 | 29.87 | −.01 | 82.0 | +2.8 | 100 | 3 | 93 | 64 | 6 | 71 | 29 | 65 | 67 | 4.50 | +1.5 | 7 | 10.7 | s. | 27 | se. | 4 | 12 | 11 | 7 | 4.7 | .0 | .0 | 6 |
| Amarillo [3] | 3,676 | 10 | 49 | 26.24 | 29.84 | −.01 | 76.2 | +3.4 | 99 | 15 | 89 | 57 | 5 | 63 | 35 | 54 | 53 | 1.01 | −1.8 | 2 | 17.3 | s. | 42 | s. | 12 | 10 | 13 | 7 | 4.6 | .0 | .0 | 6 |
| Del Rio | 960 | 63 | 71 | 28.89 | 29.85 | .00 | 83.0 | −.4 | 100 | 29 | 92 | 66 | 5 | 74 | 24 | 69 | 68 | 1.28 | −1.3 | 4 | 11.2 | se. | 25 | se. | 18 | 6 | 14 | 10 | 5.8 | .0 | .0 | 3 |
| Roswell | 3,566 | 75 | 85 | 26.31 | 29.80 | .00 | 78.0 | +1.7 | 99 | 15 | 92 | 57 | 19 | 64 | 37 | 51 | 48 | 2.39 | +.7 | 9 | 9.4 | s. | 28 | s. | 25 | 13 | 12 | 5 | 3.9 | .0 | .0 | 13 |
| **Southern Plateau** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | 78.1 | −0.3 | | | | | | | | | 33 | 0.50 | +0.2 | | | | | | | | | | 2.9 | | | |
| El Paso [1] | 3,778 | 82 | 101 | 26.11 | 29.75 | .00 | 79.6 | +1.6 | 101 | 23 | 94 | 59 | 5 | 65 | 35 | 47 | 39 | 1.63 | +1.0 | 5 | 11.4 | sw. | 38 | sw. | 2 | 18 | 8 | 4 | 3.6 | .0 | .0 | 13 |
| Albuquerque [1] | 5,314 | 5 | 45 | 24.72 | 29.76 | ..... | 74.0 | +1.4 | 97 | 23 | 88 | 51 | 3 | 60 | 37 | 38 | 33 | 1.20 | +.7 | 8 | 10.4 | s. | 44 | nw. | 17 | 16 | 11 | 3 | 3.4 | .0 | .0 | 7 |
| Phoenix [3] | 1,107 | 39 | 87 | 28.63 | 29.73 | −.01 | 84.4 | −.1 | 108 | 18 | 99 | 61 | 6 | 70 | 39 | 43 | 30 | .01 | −.1 | 1 | 6.7 | w. | 19 | sw. | 3 | 19 | 7 | 4 | 2.9 | .0 | .0 | 3 |
| Tucson [1] | 2,555 | 5 | 23 | 27.24 | 29.75 | ..... | 83.2 | ..... | 106 | 17 | 98 | 55 | 13 | 68 | 42 | 40 | 26 | .13 | −.1 | 4 | ..... | sw. | ..... | ..... | ..... | 19 | 7 | 4 | 3.4 | .0 | .0 | 4 |
| Yuma | 142 | 9 | 54 | 29.62 | 29.74 | .00 | 83.7 | −1.0 | 112 | 17 | 101 | 55 | 14 | 67 | 47 | 48 | 36 | T | .0 | 0 | 6.0 | w. | 21 | w. | 3 | 27 | 3 | 0 | 1.0 | .0 | .0 | 1 |
| Independence | 3,957 | 5 | 26 | 25.89 | 29.85 | +.07 | 68.8 | −3.5 | 94 | 17 | 84 | 44 | 5 | 54 | 41 | 34 | 32 | .01 | −.1 | 1 | ..... | n. | ---- | ..... | ---- | 27 | 3 | 0 | ---- | .0 | .0 | 1 |
| **Middle Plateau** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | 62.2 | −2.9 | | | | | | | | | 45 | 0.88 | +0.4 | | | | | | | | | | 3.7 | | | |
| Reno [3] | 4,527 | 61 | 76 | 25.43 | 29.91 | +.05 | 57.2 | −5.2 | 90 | 28 | 75 | 31 | 2 | 40 | 50 | 34 | 53 | .18 | −.1 | 4 | 8.4 | nw. | 37 | se. | 1 | 12 | 13 | 5 | 3.8 | .0 | .0 | 2 |
| Tonopah | 6,090 | 9 | 20 | 24.00 | 29.83 | ..... | 60.0 | ..... | 86 | 18 | 73 | 33 | 2 | 47 | 34 | 26 | 34 | .84 | +.6 | 5 | ..... | nw. | ..... | ..... | ..... | 19 | 10 | 1 | ..... | .0 | .0 | 2 |
| Winnemucca | 4,339 | 5 | 56 | 25.57 | 29.88 | .00 | 59.3 | −3.5 | 89 | 28 | 75 | 32 | 2 | 44 | 44 | 34 | 49 | .57 | −.2 | 7 | 8.0 | sw. | 38 | nw. | 1 | 12 | 13 | 5 | 4.2 | T | .0 | 3 |
| Modena | 5,473 | 10 | 46 | ..... | ..... | ..... | 60.1 | −3.2 | 89 | 27 | 78 | 32 | 5 | 43 | 46 | ..... | ..... | .79 | +.5 | 4 | 12.3 | sw. | 38 | sw. | 22 | 21 | 7 | 2 | 2.4 | T | .0 | 0 |
| Salt Lake City [1] | 4,227 | 32 | 46 | 25.54 | 29.83 | −.02 | 63.8 | −1.9 | 93 | 29 | 77 | 38 | 3 | 50 | 39 | 40 | 49 | 2.09 | +1.4 | 6 | 10.0 | se. | 34 | nw. | 2 | 13 | 10 | 7 | 4.1 | T | .0 | 7 |
| Grand Junction | 4,602 | 60 | 68 | 25.32 | 29.82 | −.01 | 70.6 | −.8 | 96 | 27 | 84 | 40 | 3 | 58 | 35 | 36 | 34 | .77 | +.4 | 6 | 7.8 | se. | 32 | sw. | 4 | 15 | 8 | 7 | 4.2 | .0 | .0 | 9 |
| **Northern Plateau** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | 60.2 | −3.2 | | | | | | | | | 59 | 1.44 | +0.3 | | | | | | | | | | 5.7 | | | |
| Baker [3] | 3,471 | 36 | 54 | 26.42 | 29.97 | +.02 | 54.2 | −4.4 | 83 | 17 | 67 | 30 | 2 | 42 | 38 | 42 | 71 | 2.81 | +1.5 | 14 | 5.8 | n. | 21 | sw. | 19 | 3 | 17 | 10 | 6.1 | .0 | .0 | 10 |
| Boise [1] | 2,739 | 5 | 49 | 27.09 | 29.89 | −.02 | 61.6 | −2.9 | 91 | 17 | 75 | 38 | 2 | 49 | 36 | 42 | 56 | 1.09 | +.2 | 7 | 9.4 | nw. | 45 | sw. | 29 | 11 | 11 | 8 | 5.0 | .0 | .0 | 5 |
| Pocatello [1] | 4,478 | 5 | 31 | 25.42 | 29.87 | .00 | 59.2 | −2.3 | 86 | 30 | 73 | 35 | 4 | 46 | 42 | 38 | 54 | 1.38 | −.3 | 10 | 9.8 | sw. | 36 | sw. | 11 | 13 | 8 | 9 | 4.8 | T | .0 | 7 |
| Spokane [1] | 1,929 | 27 | 42 | 27.93 | 29.95 | +.01 | 58.6 | −4.2 | 86 | 29 | 70 | 39 | 11 | 47 | 36 | 44 | 64 | 1.42 | +.1 | 11 | 6.5 | ne. | 29 | nw. | 18 | 5 | 8 | 17 | 7.1 | .0 | .0 | 5 |
| Walla Walla | 991 | 57 | 65 | 28.91 | 29.95 | −.01 | 63.2 | −3.3 | 89 | 29 | 74 | 44 | 2 | 53 | 31 | ..... | ..... | 1.59 | +.5 | 13 | 5.6 | s. | 21 | s. | 24 | 11 | 9 | 10 | 5.2 | .0 | .0 | 2 |
| Yakima | 1,076 | 58 | 67 | 28.82 | 29.96 | ..... | 64.2 | −2.2 | 94 | 29 | 76 | 38 | 2 | 52 | 31 | 42 | 51 | .34 | −.2 | 4 | 7.0 | nw. | 22 | n. | 8 | 6 | 13 | 11 | 5.8 | .0 | .0 | 3 |
| **North Pacific Coast Region** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | 58.8 | −1.0 | | | | | | | | | 74 | 1.75 | +0.1 | | | | | | | | | | 6.4 | | | |
| North Head | 211 | 5 | 56 | 29.85 | 30.06 | +.07 | 54.6 | −.2 | 65 | 25 | 59 | 47 | 1 | 50 | 13 | 50 | 85 | 1.61 | −.7 | 12 | 13.3 | n. | 34 | s. | 22 | 1 | 7 | 22 | 8.0 | .0 | .0 | 0 |
| Seattle [3] | 125 | 90 | 321 | 29.90 | 30.03 | +.03 | 60.0 | −1.4 | 83 | 29 | 68 | 46 | 2 | 52 | 28 | 49 | 70 | .92 | −.4 | 8 | 7.5 | w. | 26 | s. | 22 | 8 | 11 | 11 | 6.1 | .0 | .0 | 0 |
| Tacoma | 194 | 172 | 201 | 29.84 | 30.03 | .00 | 59.1 | +.4 | 80 | 29 | 68 | 44 | 2 | 51 | 26 | ..... | ..... | 1.45 | .0 | 8 | 7.4 | n. | 25 | s. | 22 | 6 | 16 | 8 | 5.8 | .0 | .0 | 2 |
| Olympia | 86 | 9 | 61 | 29.98 | 30.07 | +.05 | 53.2 | +.2 | 65 | 29 | 57 | 45 | 1 | 49 | 14 | 49 | 85 | 1.18 | −2.0 | 10 | 8.5 | w. | 27 | s. | 5 | 4 | 8 | 18 | 7.2 | .0 | .0 | 0 |
| Tatoosh Island | 1,329 | 29 | 58 | 28.60 | 29.99 | ..... | 62.0 | −3.8 | 92 | 28 | 75 | 40 | 22 | 49 | 41 | 45 | 62 | 1.85 | +1.1 | 11 | ..... | nw. | ..... | ..... | ..... | 9 | 10 | 11 | 5.6 | .0 | .0 | 4 |
| Medford [1] | 154 | 68 | 106 | 29.87 | 30.03 | −.01 | 61.4 | −1.0 | 88 | 29 | 70 | 46 | 1 | 53 | 27 | 50 | 74 | 3.04 | +1.5 | 12 | 5.3 | nw. | 16 | w. | 1 | 8 | 9 | 13 | 6.3 | .0 | .0 | 5 |
| Portland, Oreg. [3] | 510 | 45 | 76 | 29.50 | 30.04 | +.01 | 61.2 | −1.3 | 88 | 16 | 72 | 45 | 15 | 50 | 38 | 48 | 69 | 2.23 | +1.1 | 9 | 4.8 | n. | 17 | w. | 19 | 8 | 5 | 17 | 6.1 | .0 | .0 | 1 |
| Roseburg | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Middle Pacific Coast Region** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | 64.6 | −2.0 | | | | | | | | | 66 | 0.68 | +0.2 | | | | | | | | | | 4.2 | | | |
| Eureka | 60 | 72 | 88 | 30.02 | 30.08 | +.03 | 54.5 | +.2 | 64 | 22 | 58 | 43 | 2 | 51 | 14 | 49 | 84 | .47 | −.2 | 7 | 7.7 | n. | 26 | n. | 3 | 5 | 12 | 13 | 6.7 | .0 | .0 | 0 |
| Redding [1] | 722 | 20 | 34 | 29.15 | 29.90 | ..... | 69.8 | −5.3 | 98 | 17 | 82 | 47 | 22 | 58 | 32 | 43 | 44 | 1.79 | +1.0 | 6 | 8.8 | nw. | 26 | s. | 10 | 17 | 8 | 5 | 3.7 | .0 | .0 | 7 |
| Sacramento [3] | 66 | 92 | 115 | 29.85 | 29.91 | +.02 | 67.6 | −1.8 | 101 | 17 | 82 | 48 | 22 | 53 | 37 | 46 | 56 | .35 | +.2 | 3 | 8.4 | s. | 22 | sw. | 1 | 21 | 9 | 0 | 1.8 | .0 | .0 | 0 |
| San Francisco | 155 | 112 | 132 | 29.82 | 29.97 | +.01 | 57.4 | −1.1 | 90 | 16 | 63 | 49 | 7 | 52 | 30 | 49 | 80 | .13 | .0 | 1 | 11.2 | w. | 28 | w. | 11 | 13 | 12 | 5 | 4.4 | .0 | .0 | 0 |
| **South Pacific Coast Region** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | 67.7 | −1.3 | | | | | | | | | 60 | 0.01 | −0.1 | | | | | | | | | | 2.9 | | | |
| Fresno [1] | 327 | 5 | 35 | 29.56 | 29.90 | +.05 | 71.6 | −4.1 | 105 | 17 | 88 | 50 | 13 | 55 | 40 | 41 | 42 | T | −.1 | 0 | 8.7 | nw. | 26 | nw. | 3 | 25 | 4 | 1 | 1.2 | .0 | .0 | 0 |
| Los Angeles | 338 | 223 | 250 | 29.58 | 29.92 | +.02 | 66.4 | .0 | 88 | 27 | 76 | 50 | 14 | 56 | 29 | 51 | 66 | .01 | −.1 | 1 | 6.1 | w. | 18 | se. | 2 | 19 | 5 | 6 | 3.1 | .0 | .0 | 0 |
| San Diego [1] | 87 | 20 | 55 | 29.85 | 29.92 | .00 | 65.2 | +.2 | 80 | 26 | 73 | 50 | 14 | 58 | 24 | 55 | 72 | .01 | .0 | 1 | 7.3 | w. | 17 | nw. | 20 | 14 | 9 | 7 | 4.4 | .0 | .0 | 1 |
| **West Indies** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| San Juan, P. R. | 82 | 10 | 54 | 29.93 | 30.04 | ..... | 78.4 | −1.3 | 88 | 19 | 82 | 71 | 16 | 75 | 14 | 73 | 81 | 5.93 | +.6 | 16 | 12.8 | e. | 31 | e. | 16 | 0 | 19 | 11 | 7.2 | .0 | .0 | 6 |
| **Panama Canal** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Balboa Heights | 118 | 6 | 92 | ..... | [3] 29.84 | +.02 | 79.8 | −.3 | 90 | 10 | 86 | 69 | 28 | 73 | 20 | ..... | [3] 88 | 10.75 | +2.5 | 22 | 4.9 | nw. | 35 | se. | 27 | 0 | 12 | 18 | 7.4 | .0 | .0 | 6 |
| Cristobal | 27 | 47 | 97 | ..... | [3] 29.85 | +.02 | 80.5 | +.1 | 89 | 8 | 85 | 73 | 3 | 76 | 15 | 75 | [3] 84 | 12.18 | −1.7 | 23 | 6.5 | w. | 25 | nw. | 27 | 0 | 4 | 26 | 9.0 | .0 | .0 | 17 |
| **Alaska** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Nome | 43 | 25 | 51 | ..... | 29.95 | ..... | 47.3 | +1.7 | 75 | 24 | 55 | 35 | 14 | 40 | ---- | ---- | 81 | .28 | −.8 | 5 | 8.0 | w. | 24 | w. | 17 | 4 | 14 | 12 | ---- | .0 | .0 | 2 |
| Fairbanks | 455 | 4 | 82 | ..... | 29.91 | ..... | 59.4 | +1.0 | 83 | 11 | 75 | 39 | 19 | 44 | ---- | 43 | 56 | .26 | −1.1 | 2 | 7.1 | w. | 28 | e. | 15 | 5 | 14 | 11 | ---- | .0 | .0 | 3 |
| Juneau | 80 | 96 | 116 | ..... | 30.05 | ..... | 55.2 | +1.0 | 80 | 22 | 62 | 41 | 9 | 48 | ---- | 46 | 74 | 3.49 | −.6 | 16 | 6.1 | w. | 18 | se. | 16 | 4 | 4 | 22 | ---- | .0 | .0 | 0 |
| Anchorage | 135 | 36 | 47 | ..... | 29.95 | ..... | 54.7 | +1.2 | 79 | 9 | 64 | 34 | 3 | 45 | ---- | 45 | 69 | 1.20 | +.5 | 12 | 5.0 | nw. | 24 | se. | 26 | 5 | 10 | 15 | ---- | .0 | .0 | 1 |
| **Hawaiian Islands** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Honolulu | 38 | 86 | 100 | ..... | ..... | ..... | 78.1 | +1.5 | 85 | 9 | 82 | 71 | 6 | 74 | 12 | ---- | ---- | .48 | −.4 | 13 | 10.8 | e. | 27 | e. | 19 | 13 | 13 | 4 | 4.0 | .0 | .0 | 0 |

## LATE REPORTS FOR MAY 1943

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Alaska** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bethel | 22 | 5 | 32 | 29.89 | ..... | ..... | 41.3 | +.8 | 68 | 31 | 49 | 27 | 10 | 33 | 33 | 34 | 77 | 1.32 | +.5 | 13 | ..... | s. | ---- | ..... | ---- | 3 | 5 | 23 | 7.7 | 3.1 | .0 | 1 |
| Ketchikan | 75 | 69 | 91 | 30.04 | 30.06 | ..... | 48.0 | −.6 | 70 | 31 | 55 | 35 | 7 | 41 | 30 | 40 | 78 | 8.94 | +.6 | 21 | 7.3 | se. | 28 | w. | 31 | 4 | 3 | 24 | 8.3 | T | .0 | 0 |
| Kotzebue | 20 | 4 | 31 | 29.94 | 29.96 | ..... | 34.4 | +4.4 | 53 | 21 | 40 | 22 | 6 | 29 | 20 | 31 | 88 | .65 | +.4 | 8 | ..... | w. | 33 | w. | 16 | 1 | 7 | 23 | 8.0 | 2.2 | T | 2 |
| McGrath | 331 | 4 | 31 | 29.56 | 29.94 | ..... | 45.9 | ..... | 76 | 31 | 56 | 28 | 5 | 35 | 34 | 35 | 66 | 1.72 | ..... | 16 | ..... | s. | 29 | s. | 20 | 3 | 9 | 19 | 7.5 | T | .0 | 0 |
| Northway | 1800 | 5 | 32 | 28.10 | ..... | ..... | 46.5 | ..... | 70 | 24 | 59 | 21 | 3 | 34 | 36 | 31 | 62 | .79 | ..... | 11 | ..... | w. | ---- | ..... | ---- | 6 | 17 | 8 | 5.0 | T | .0 | 2 |

[1] Data are airport records.
[2] Barometric data (adjusted to old city elevation) and hygrometric data from airport; otherwise city office records.
[3] Observations taken hourly.
[4] Wind, clear, partly cloudy and cloudy data from city office records; other data from airport.
[5] Temperature, pressure (adjusted to old city elevation) and hygrometric data from airport; otherwise city office records.

Note—Except as indicated by notes 1, 2, 4, and 5 data in table are city office records.

## SEVERE LOCAL STORMS, MAY AND JUNE 1943

(Compiled by Mary O. Souder)

[The table herewith contains such data as has been received concerning severe local storms that occurred during the month. A revised list of tornadoes will appear in the United States Meteorological Yearbook]

| Place | Date | Time | Width of path, yards | Loss of life | Value of property destroyed | Character of storm | Remarks |
|---|---|---|---|---|---|---|---|
| | *May* | | | | | | |
| Cass County, Iowa | 5 | 3-4 p. m. | | 0 | $82,000 | Tornadoes and hail. | A number of apparently unrelated tornadoes, wind, and hail storms developed during midafternoon; the first group about 3 p. m.; the second about 4 p. m. Paths ranged from about 2 to 8 miles long. |
| Dallas, Greene, and Boone Counties, Iowa. | 5 | 3-7 p. m. | | | 10,000 | Wind and hail | Up to one-third of oats lost in some fields; several small buildings blown down. |
| Sidney, Knox, Anderson, Imogene, Farragut and northwest of Shenandoah, Iowa. | 5 | 3:25-4 p. m. | [1] 2 | 0 | 50,000 | Tornado and hail | The storm developed between Knox and Sidney and traveled northeastward for about 18 miles to the northwest corner of Fremont County, striking at Sidney and near Anderson and Imogene. 4 persons were injured. The track was not continuous and at times the tornado characteristics almost disappeared. Damage also occurred simultaneously along another path about 6 miles long, parallel to and several miles east of the main storm. |
| Hills County, Iowa | 5 | 3:30 p. m. | 880 | 0 | 20,000 | do | Storm traveled along an irregular path about 8 or 10 miles long in open country, along the West Fork Nishnabotna River; 2 persons injured. |
| Adair County, Iowa | 5 | 4-4:30 p. m. | 880 | | 25,000 | Wind and hail | Property damaged; crop loss not serious because of lateness of the season. |
| Story, Marshall and Grundy Counties, Iowa. | 5 | 5 p. m. | [1] 2 | 0 | 20,000 | Tornado and hail | A tornado that originated several miles east of Cole, in Story County, moved forward along an irregular path northeast and across Marshall County into Grundy County, and then traveled almost east for several miles. Total length of path about 28 miles. While the storm began its destructive existence as a tornado, the funnel cloud lifted and disappeared along a good part of the path and damage was scattered. Loss to gardens and oats by hail. This storm was followed by a second one about 2 hours later. |
| Fayette County, Iowa | 5 | 6 p. m. | | 0 | 2,000 | Wind and tornado | Wind uprooted trees and wrecked or damaged small buildings in a rather broad area about 6 miles long. A twister appears to have developed near the center of the area, but most of the damage was caused by straight-line winds. |
| Pottawattamie County, Iowa | 5 | 6 p. m. | | | 2,000 | Wind and hail | Property damaged. |
| Clayton County, Iowa | 5 | 6:30 p. m. | | 0 | 6,000 | Tornado | Wind caused damage in a small area, about 12 miles south of Elkader, mostly on a farm. The storm seems to have been a tornado that was not fully developed. |
| Marshall County, Iowa | 5 | 7:30 p. m. | 880 | 0 | 5,000 | do | The second tornado of the day in Marshall County, developed near the Story County line, a few miles north of the track of an earlier storm listed above. 2 persons injured; path 20 miles long. |
| Barada to Shubert, Nebr., and eastward to the Missouri River. | 5 | do | [1] 5-6 | | 10,000 | Hail | Loss in crops, $3,000; property damage, $7,000. |
| Beatrice, Nebr. | 5 | p. m. | [1] 6 | | 15,000 | do | Loss in crops, $10,000; property damage, $5,000. |
| Boyd, Tex. | 7 | 7:30 p. m. | 880 | 0 | 12,000 | Tornado | $10,000, property damage; loss in livestock, $2,000; some loss in crops. |
| Alcorn County, Miss. | 8 | 4:30 p. m. | | | | Thundersqualls | Much damage to young crops on lowlands; some trees blown down; electric and telephone lines damaged. |
| Quinton, Okla., southeast of | 9 | 3 p. m. | | | 2,000 | Wind | A cooling tower belonging to the Oklahoma Gas and Electric Company, and some trees blown down. |
| Durant, Okla., vicinity of | 10 | 4 a. m. | | 0 | 1,000 | Tornado | Storm moved north about 1 mile before lifting. Property damage light due to a few buildings in its path. |
| Marlin, Tex. | 10 | 8:20 a. m. | 110 | | 4,800 | Straight-line-wind | Loss in crops, $800; property damage $4,000. |
| Terrell, Poetry, Quhilan and Cash Tex. | 10 | 9:30 a. m. | | 0 | 10,000 | Tornado | Property damage, $10,000. Crop loss negligible; 2 persons injured. |
| Midway, Tex., vicinity of | 10 | 11 a. m. | 100 | 0 | 2,000 | do | Damage to property. |
| Gainesville, Tex. | 10 | a. m. | | | | Straight-line-wind | Much property loss. |
| Laird Hill and Kilgore, Tex. | 10 | 12:50-1:05 p. m. | | 4 | 100,000 | Tornado | Buildings damaged; small crop loss; more than 50 oil derricks blown down; 25 persons injured. |
| Mermentau, La. | 10 | 6:30 p. m. | 100 | 0 | 25,000 | do | Rice mill demolished and contents damaged; 2 houses blown off their foundations; trees uprooted. |
| St. Joseph, La. | 10 | 8 p. m. | 400 | | 4,500 | Wind | 2 barns and several farm labor houses destroyed; 1 person injured. |
| St. Clair, Macomb, and Wayne Counties, Mich. | 11 | | | | 500,000 | Excessive rain | Rains in southeastern lower Michigan caused damage from flooding. In Mount Clemens it was necessary to evacuate about 500 families from their homes, while in other areas damage was confined mainly to flooded basements, washed-out roads, and undermined bridges. |
| York, Pa. | 11 | 9:30 p. m. | | | 10,000 | Electrical | Factory burned and machinery damaged. |
| Kendall, Fla. | 12 | | | | 25,000 | Squalls | Storm confined to small area. 20 small planes at Brown's Airport, in Kendall, and 9 at Chapman Field, owned by Embry Riddle Aviation School were damaged. |
| Bicknell, Ind., south of | 14 | 8:30 p. m. | 50 | 0 | 1,000 | Tornado | Buildings damaged; trees uprooted; path from southwest to northeast. |
| Ross, Tex. | 15 | 1 p. m. | [1] 5 | | 2,000 | Hail | Property damage, $1,500; loss in truck and gardens, $500. |
| Fremont and Montgomery Counties, Iowa. | 15 | 3 p. m. | [1] 2 | 0 | 25,000 | Tornado and wind. | A tornado formed southwest of Hamburg, Iowa, on Nebraska Island, and moved northeastward to north of Red Oak in Montgomery County total distance of between 45 to 50 miles. The path of the storm was not continuous. Some of the destruction was caused by straight wind, heavy rain, flooding and hail which accompanied the tornado. Loss in Montgomery County is estimated at $15,000; and in Fremont County, at $10,000. |
| Ringgold, Clarke, Decatur and Lucas Counties, Iowa. | 15 | 5-6:30 p. m. | [1] 1 | 0 | 108,000 | Tornadoes | Storms moved from southwest to northeast with paths of from 20 to 30 miles; 200 insurance claims were filed. |
| Adams and Union Counties, Iowa. | 15 | 5:30-5:40 p. m. | 440 | 0 | 50,000 | Tornado | Scattered destruction all along the storm's path of over 20 miles, but greatest damage occurred in the immediate vicinity of Creston and northeastward into Lincoln Township. In Creston the greatest damage occurred to trees, chimneys, porches, and small outbuildings, but in the open country substantial barns and other buildings were wrecked. |
| Adair County, Iowa | 15 | 5:30-6 p. m. | | 0 | 20,000 | do | Storm moved from south-southwest to east-northeast in an area where other destruction was caused by straight winds. |
| Dallas County, Iowa | 15 | 6 p. m. | | 0 | 15,000 | Tornado, wind, and hail. | Storm struck about a mile west of Waukee damaging buildings on several farms. At about the same time, straight-line winds caused much damage especially at and near Adel. |
| Jasper, Poweshiek, and Marshall Counties, Iowa. | 15 | 6-7 p. m. | | | 25,500 | Wind and hail | Property damage, $25,000; loss in crops, $500. |
| Marion County, Iowa | 15 | 6:15 p. m. | | 0 | 50,000 | Tornado and hail | A tornado destroyed much property along a line north of Knoxville, a distance of about 18 to 20 miles. Heaviest loss occurred between Newbern and Melcher, the damage being more spotted as the storm progressed northward. |
| Des Moines, Iowa | 15 | 6:20 p. m. | 880 | 0 | 3,500 | Tornado | A small tornado developed in the northwestern residential area of Des Moines and skipped for a distance of about 5 miles to a point east and north of Johnson Station. Most of damage to chicken houses, outbuildings, trees, and roofs, although 2 small houses were demolished. |
| Oklahoma between Pryor and Choteau. | 15 | 6:20 p. m. | | 0 | 600 | do | Storm moved from southwest to northeast for a distance of 4 miles, touching the ground at intervals. The width of the path was about 33 yards with major destruction in a path 17 to 20 yards wide. There was very little property damage due to the tornado striking at intervals. Eight persons were injured. |

[1] Miles instead of yards.

## SEVERE LOCAL STORMS, MAY AND JUNE 1943—Continued

| Place | Date | Time | Width of path, yards | Loss of life | Value of property destroyed | Character of storm | Remarks |
|---|---|---|---|---|---|---|---|
| | *May* | | | | | | |
| Monroe County, Iowa | 15 | 6:30 p. m. | | | 2,000 | Wind, hail and rain. | Property damaged. |
| Iowa City, Oxford, vicinity of Swisher and Solon, Iowa | 15 | 7:45–8 p. m. | | 0 | 15,000 | 2 tornadoes, wind and hail. | A small tornado caused great damage on 1 farm about 8 miles south of Iowa City. Another tornado striking near Oxford, damaged buildings on 2 farms. At about the same time wind wrecked barns near Swisher and Solon. Tomato plant damage to the extent of $3,000. |
| Boone County, Iowa | 15 | P. m. | | | 750 | Wind | Plate glass blown out in Boone; farm buildings damaged in northern part of the county. |
| Clinton County, Iowa | 15 | do | | | 10,000 | Wind and hail | Trees uprooted, a barn and many small buildings wrecked and other barns damaged by wind about midnight. Some livestock killed. |
| Walford, Shellsburg, and Norway, Iowa. | 15 | do | | | 3,000 | do | Hail damaged tomato plants and caused loss in oats near Walford and Norway with some wind damage in this area and also on 1 farm near Shellsburg. |
| Milwaukee, Wis | 16 | do | | | 4,000 | Wind | Property damaged. |
| Michigan, lower portion | 16 | | | | | do | Much damage occurred. |
| Oklahoma City, Okla | 16 | | | | 750,000 | Hail | Heavy damage to greenhouses, roofs, and other property. |
| Alva, Okla., 12 miles northeast. | 17 | | | | | Tornado | A funnel cloud which did not touch the ground. The storm moved to the east-northeast and disappeared southeast of Kiowa, Kans., but still on the Oklahoma side. It raised and lowered between 50 and 100 yards above the ground as it moved across country. No damage reported. |
| Lebanon, Pa., vicinity of | 18 | P. m. | | | 15,000 | Electrical | Barn burned. |
| Marshall, N. Y. | 18 | | 880–1,320 | | | Electrical and hail | Barns unroofed, silos down, trees uprooted, and windows broken. Six cows had to be killed after being injured by a falling barn. |
| Hanover, Pa., and vicinity | 18 | 8:30 p. m. | | | 1,500 | Rain | Streams rose suddenly; property damaged. |
| Progresso, N. Mex. | 21 | 3:35 p. m. | | | | Heavy hail | Property damaged. |
| Cimarron, N. Mex. | 21 | 5–6 p. m. | [1] 10 | | 10,000 | do | Path 15 miles long. |
| Springer and Maxwell, N. Mex., and vicinities. | 21 | 6–7 p. m. | | | | Heavy hail | No details. |
| Artesia, N. Mex. | 22 | 3 p. m. | | | | Severe hail | Do. |
| Johnsonburg, Pa., and vicinity. | 25 | 8 p. m. | | | | Rain | Streams rose suddenly under heavy rain; lowlying areas flooded; roads blocked; washout on Pennsylvania Railroad derailed train; 100 families driven from homes. |
| Whiteville, N. C., 12 miles northeast. | 26 | 1:20 a. m. | | 1 | 3,000 | Tornado | While the destruction wrought was in a thickly settled community, 1 dwelling was struck. The house destroyed was a well built 4-room, 1 story structure. It was lifted completely from its brick foundation, carried about 150 yards in a northeasterly direction, torn into pieces and deposited from 150–500 yards northeast of the former sight. There was a lighted lamp in the house causing a fire which burned everything. 1 of the occupants was killed; 2 seriously injured and 2 slightly injured. A frail 2-story barn not over 75 yards from the house to the northwest was not touched. |
| Stillwater, Perkins, and Meham, Okla., and vicinities. | 26 | 6:30 p. m. | [1] 10 | | 6,000 | Hail | Loss in crops; path 15 miles long. |
| Hardwick, Minn., and vicinity | 28 | 8 p. m. | [1] 10 | | 100,000 | Thunderstorm squalls, hail, and heavy rain. | A number of barns, outbuildings, silos, and windmills demolished; houses damaged; many trees uprooted; some livestock and much poultry perished. Path 25 miles long; hail damage $10,000; heavy rain, $50,000; included in estimate. |
| Harford County, Md., central portion. | 28 | | | | | Hail | Thisstorm began in Forest Hill and went through Hickory, Gibson, Kalima, southeastward, through Fountain Greene, Fulford, Churchville, Calvary, Aberdeen, Abingdon, Bush River, Perryman, Michaelville, and Aberdeen Proving Grounds to Chesapeake Bay. Hailstones were from pea to walnut size except ½ to 2 inches in diameter in the Churchville neighborhood where crops, gardens, and tree fruits were damaged slightly and considerable window glass broken. Amount of damage not estimated. |
| Big Horn County, Mont. | 28 | | | | 1,000 | Wind and hail | Loss in sugar beets, beans, and hay. |
| Spink and Clark Counties, S. Dak. | 28 | | | | 2,000 | Heavy hail and high wind. | Storm extended from the extreme southeast corner of Spink County into Clark County, breaking windows and wrecking 2 barns. |
| Morrill, Nebr., vicinity of | 29 | 3:30–4:30 p. m. | [1] 4 | | | Hailand excessive rain. | Potato cellars flooded; roads, bridges, and irrigation ditches washed out. Damage, estimated to be in thousands of dollars, not estimated. |
| Pampa, Tex. | 29 | 4:35 p. m. | 33 | 0 | | Torn ado | Buildings, telephone, and electric wires slightly damaged; no loss in crops. |
| Randolph, Minn., and vicinity. | 30 | 12:05 a. m. | [1] 10 | | 60,000 | Thundersqualls and heavy rain. | Many silos and windmills wrecked; farms, outbuildings, and houses damaged; about 100 poles down; railroad roundhouse blown over; branches of trees broken off; some livestock perished; growing crops damaged; path 30 miles long. |
| Benton Harbor, St. Joseph, Mich. | 30 | | | | 500,000 | Torrential rain and flood. | Heavy rains over the lower St. Joseph and Paw Paw watersheds caused a flash flood at Benton Harbor to St. Joseph. Property damaged and highway and rail traffic blocked. 6.60 inches of rain fell in Benton Harbor in 24 hours. |
| Coopersville, Morley, Kent City and near Packard Station, Mich. | 31 | | | 0 | | Tornadoes | 2 persons slightly injured and minor property damage in a small area near Coopersville. There was also slight property damage and livestock loss in the vicinities of Morely, Kent City, and Packard Station. |
| | *June* | | | | | | |
| Malvern, Iowa | 1 | 1:27 a. m. | 440 | | $1,500 | Windsquall and rain. | 15 steel Government grain bins were overturned and 3 of them carried 600 feet across a highway overpass, more than 20 feet in the air. 0.96 inches of rain, most of it in a few minutes, recorded. |
| Charles City, Floyd, Rudd, and Dumont, Iowa. | 1 | 3:30–4 a. m. | | | 26,000 | Wind | Considerable damage on 6 farms; small buildings and trees damaged. |
| Neenah, Wis., and vicinity | 1 | 8:45 a. m. | 2,640 | | 10,000 | do | Several small buildings wrecked or moved; some roofs ripped off; trees blown down, and electric service interrupted. |
| Marshall County, Iowa | 1 | 5 p. m. | | | 10,000 | Thundersquall and hail. | Heavy rains caused flash floods in all parts of the county. Barn and contents burned after being struck by lightning. |
| Oxford, Tiffin, and Iowa City, Iowa. | 1 | 7–8:30 p. m. | | | 85,000 | Rain and flood | Excessively heavy rains caused Rhine Creek at Oxford, Clear Creek at Tiffin, and Ralston Creek and the Iowa River to overflow at Iowa City. Crops were washed out and there was much damage from erosion. Bridge washed away at Oxford, and several buildings wrecked or damaged by flood waters. |
| Clinton and Shawassee Counties, Mich. | 1 | 8:50 p. m., E. S. T. | | 0 | 600,000 | Tornado | 265 farm buildings demolished plus loss in trees, livestock, power lines, and other items. No one killed or seriously injured. This was one of the most destructive tornadoes of Michigan's history. Weather Bureau cooperative instrument shelter, located on Michigan State Farm, in the eastern section of the storm's parth, carried away and not a trace of it has been seen. |
| Hopkinton, Iowa | 1 | | | | 4,000 | Wind | Barn destroyed. |
| Wisconsin, from Lewis and Alpha, northeastward to Webster. | 2 | 4–4:30 p. m. | | 2 | 25,000 | Wind and rain | Farm property damaged; communication and power service disrupted, and 4 persons injured. |
| Carroll, Shelby, Harrison, and Pottawattamie, Counties, Iowa. | 2 | P. m. | | | 100,000 | Rain and flood | Soil eroded, fields washed; small streams overflowed and flooded lowlands Railroad tracks washed out. |
| Wannakee, Wis., and vicinity | 3 | 7:30 p. m. | [1] 2½–3 | | 3,500 | Wind and hail | Barn and several tobacco sheds blown down; roofs and chimneys damaged; trees blown down; path about 12 miles long. |
| Manitowoc, Wis. | 3 | 7:45 p. m. | | | 2,000 | Thunderstorm and wind. | Property damaged. |
| Anderson County, Kans. | 3 | 10:30 p. m. | [1] 6 | | 60,000 | Heavy hail | Loss in crops, $40,000; property damage, $20,000; path 23 miles long. |

[1] Miles instead of yards.

## SEVERE LOCAL STORMS, MAY AND JUNE 1943[1]—Continued

| Place | Date | Time | Width of path, yards | Loss of life | Value of property destroyed | Character of storm | Remarks |
|---|---|---|---|---|---|---|---|
| | *May* | | | | | | |
| Walters, Okla. | 3 | | | 2 | 28,000 | Tornado | Property damage, $25,000; loss in crops, $3,000; 5 persons injured. |
| Lubbock, Tex. | 4 | 6:30 p. m. | | | | Wind and hail | Crop damage heavy; considerable replanting necessary. |
| Randlett, Okla. | 4 | | | 0 | 35,000 | Tornado and hail | Property damage, $30,000; loss in crops and livestock, $5,000. |
| Cheyenne and Thomas Counties, Iowa. | 5 | 9–10 p. m. | [1] 2–6 | | 100,000 | Heavy hail | Loss mostly in wheat; path 40 miles long. |
| Bedford, Va. | 6 | 1 p. m. | | | 1,000 | Electrical, hail and wind. | Small loss in crops. |
| Shawnee County, Kans. | 7 | 1–1:30 p. m. | [1] 2–3 | | 2,000 | Heavy hail | Storm occurred over a strip extending from south of Willard to 4 miles east of Pauline. Truck, crops and oats damaged so badly it was necessary to replant about 1,000 acres; path 16 miles long. |
| Teton County, Mont. | 7 | 3 p. m. | [1] 2 | | 10,000 | Hail | Loss in winter wheat and peas. |
| Madison, Fla. | 7 | 5 p. m. | | | 50,000 | Wind and hail | Trees, poles, and wires blown down; some small buildings unroofed and an outbuilding blown over. Damage caused by falling trees. |
| Flathead County, Mont. | 7 | do | [1] 1 | | 1,000 | Hail | Property damaged; path 4 miles long. |
| Midway, Va. | 7 | 6 p. m. | 440 | | 2,000 | do | Crops over a small area almost completely destroyed. |
| Grant and Haskell Counties, Iowa. | 7 | 6:30–9 p. m. | [1] 3–5 | | 125,000 | Heavy hail and high wind. | Chief damage to wheat; small buildings damaged; path 24 miles long. |
| Laurens County, S. C. | 7 | P. m. | | | 5,000 | Electrical | Church burned. |
| Sumter, S. C. | 7 | do | | | 2,000 | Thunderstorm | Property damaged. |
| Hartsville, S. C. | 8 | 3:30 a. m. | | | 25,000 | Electrical | 2 seed warehouses burned. |
| Boone, Polk, and Jasper Counties, Iowa. | 9 | 8–9 a. m. | 880–2,640 | | 15,000 | Wind and hail | Property damaged. |
| Hemingford, Nebr. | 9 | 6 p. m. | 167 | 2 | 30,000 | Tornado | Damage to buildings, livestock, etc.; only minor loss in crops. |
| Johnson County, Kans. | 9 | 7:45 P. m. | 440 | 2 | 600,000 | High winds | Storm struck Naval Air Base, 5 miles southwest of Olathe, where 100 planes were badly damaged. Two Navy pilots killed and 6 others persons injured; path 880 yards long. |
| Lodge, S. C. | 9 | | | | 1,200 | Electrical | No details. |
| Logan County, Kans. | 10 | 6:30 p. m. | [1] 4 | | 20,000 | High winds | Path extended from southwest of Russell Springs to near the eastern border of the county. Damage to rural property, $18,000; loss in crops, $2,000; path 25 miles long. |
| Winnebago County, Iowa. | 11 | 4:30 p. m. | 73 | 0 | 12,000 | Tornado, rain and hail. | A small tornado developed about 6 miles southwest of Lake mills and traveled northwest along a very narrow path for about 8 or 9 miles. It caused great destruction on 1 farm and lesser damage on several others. |
| Worth County, Iowa. | 11 | 9 p. m. | | | 5,000 | Wind and rain | Trees and buildings damaged; streets flooded; small streams overflowed, damaging highways and bridges. |
| Berryville, Va., 3 miles east. | 13 | 5 p. m. | 2,560 | | 19,000 | Wind and hail | Property damaged, $15,000; loss in crops, $4,000. |
| Haakon County, S. Dak. | 13 | 6:50 p. m. | [1] 1 | 1 | 9,000 | Tornado | Property damaged; little crop loss; 2 persons injured. |
| Big Horn County, Mont. | 13 | 8:30 p. m. | [1] 2½ | | 2,000 | Hail | Loss to wheat and beans; hail up to the size of a golf ball; path 880 yards long. |
| Hyde County, S. Dak. | 13 | 9 p. m. | [1] 2 | 0 | 10,000 | Tornado | Property damaged; 2 persons injured; path 8 miles long. |
| Edmunds Co., S. Dak. | 13 | 10 p. m. | [1] 880–3 | | 1,500 | Wind | Property damaged; stock and poultry killed; path 40 miles long. |
| New Haven to Wallingford, Conn. | 13 | | | | 500,000 | Thunderstorm | Several houses severely damaged; barns blown down; sheds destroyed; and telephone and power lines damaged. |
| Long Prairie, Minn., and vicinity. | 14 | A. m. | | | 71,000 | Rain and flood | The heavy rainfall in Todd County and vicinities caused the Long Prairie River and a creek to overflow their banks. Railroad tracks, culverts, and a bridge were washed out. Basement flooded; a number of lowland residences were evacuated; poultry drowned; loss in growing crops. |
| Hutchinson County, S. Dak. | 14 | 4:10 p. m. | [1] 14 | | 14,500 | Hail | Property damaged; considerable poultry killed; path 15 miles long. |
| Lyman County, S. Dak. | 14 | 8:09 p. m. | [1] 4 | 0 | 2,000 | Tornado | Brooder houses, hog houses, and sheep sheds wrecked; path 10 miles long. |
| Sibley, Iowa, and vicinity. | 14 | 8:10 p. m. | 880 | | 25,000 | Wind and rain | House, 6 barns and numerous small buildings damaged. Railroad roundhouse damaged by wind and roadbed washed out by heavy rain. Trees blown down and telephone and electric service disrupted. |
| Sac City, Iowa. | 14 | 8:15 p. m. | 110 | 0 | 5,000 | Tornado | Funnel, cloud lowered and raised at intervals causing scattered damage along a path several miles long. |
| Jefferson and Scranton, Iowa. | 14 | 8:30 p. m. | | 0 | 10,000 | do | Farm buildings wrecked. |
| Ravalli, Mont. | 14 | 9 p. m. | 440 | | 500 | Hail | Loss in field of peas; path 1 mile long. |
| Kossath County, Iowa. | 14 | 9:30 p. m. | | 0 | 40,000 | 3 tornadoes | Numerous local storms over county presented a confusing picture, no one attempting to piece out an individual storm path. Communication down in many places. |
| Ringsted, Iowa. | 14 | do | [1] 1 | 0 | 10,000 | Tornado | Barns, silos, and several smaller buildings wrecked. Trees, telephone, and electric wires down. |
| Jackson, Martin, Fairbault, and Freeborn Counties, Minn. | 14 | 9:45 p. m. | [1] 4 | | 44,000 | Thundersqualls | Several barns, outbuildings, silos, and windmills demolished and a number of others damaged or moved from their foundations. Many trees uprooted, electric and communication service disrupted; several hogs killed or injured, and automobile wrecked. |
| Richburg, S. C. | 14 | P. m. | | | 5,000 | Electrical | Church burned. |
| Coffey County, Kans. | 15 | 5 a. m. | | 0 | | Tornado | Occurred east of Gridley. Large barn demolished and other farm buildings damaged. Vortex cloud seen, but apparently did not reach the ground; amount of damage not estimated. |
| Saline County, Kans. | 15 | 6 p. m. | [1] 1 | 0 | 310,000 | Tornado and hail | Storm struck Kipp and destroyed or damaged practically every building in the town. Some damage also to nearby farm buildings. Crop loss, $10,000, included in the estimate; path 2 miles long. |
| Morris County, Kans. | 15 | 8 p. m. | 440–880 | 0 | 13,000 | Tornado | Path extended from Herington Air Base, 2½ miles north of Delavan to 5 miles northeast of Council Grove. Several farms struck and many barns and sheds destroyed with some damage to residences. High wind prevailed for a considerable distance on each side of the tornado; path 22 miles long. |
| Shawnee County, Kans. | 15 | 8:30–9 p. m. | [1] 2 | | 16,500 | High winds | Chief damage to farm buildings several miles south-southwest of Topeka and at an Army base 6 miles south of Topeka where gusts as high as 62 miles per hour registered. Path 6 miles long. |
| Osage, Kans. | 15 | 9 p. m. | 220 | 0 | 200 | Tornado | Crossed U. S. Highway 7 miles north of Lyndon. Barn demolished 1 mile east of highway; length of path 2 miles. |
| Sheridan County, Kans. | 15 | 10 p. m. | [1] 5 | | 10,000 | Heavy hail | Hail to some extent fell over greater part of the county; path 20 miles long. |
| Gove, Trego, and Ellis Counties, Kans. | 15 | 11–11:30 p.m. | [1] 16 | | 1,427,000 | do | Storm extended from Grinnell through Quinter across Trego County and ended in the northwest part of Ellis County. In some parts of the path crops were totally destroyed, trees stripped of leaves, and windows broken. Damage in northwest part of Ellis County estimated at $427,000. Path 36 miles long. |
| Rush County, Kans. | 15 | P. m. | | 0 | 3,500 | Tornado | Occurred about 9 miles south-southeast of Nekoma. 2 farms struck, a residence and a number of small buildings destroyed. |
| Franklin, Kans. | 16 | 6 a. m. | 100–200 | 0 | 5,000 | do | 5 miles south of Ottawa, barns and other buildings were demolished. 1 person injured; path 7 miles long. |
| Wabasha County, Minn. | 16 | 6:30 p. m. | [1] 1 | | 1,000 | Thundersquall | Garage wrecked and several trees uprooted. |
| Pawnee, Stafford, and Reno Counties, Kans: | 16 | 1–2:30 a. m. | [1] 5–20 | | 2,000,000 | Heavy hail and high winds. | Storm path extended from western Pawnee County to Hutchinson. Wheat completely destroyed over a large area and farm animals killed. Much hail damage in Hutchinson. Many trees uprooted and buildings destroyed. |
| Buffalo, Okla. | 16 | | | 0 | 8,600 | Tornado and hail | Loss in crops, $6,000; in livestock, $600; property damaged, $2,000. |
| Patrick, Henry, Pittsylvania, Halifax, and Charlotte Counties, Va., portions of: | 17 | P. m. | | | 100,000 | Hail: wind, and electric. | Severe loss in tobacco, corn, and truck. Wind blew down fruit, forest trees and flattened grain. |
| Elbridge, N. Y. | 17 | | | | 1,750 | Electrical | Barn burned. |
| Syracuse, N. Y. | 17 | | | | 60,000 | Thunderstorm | 40 airplanes damaged, 9 total loss; number of trees and wires down; man injured. |
| Olanta, S. C., and vicinity of. | 18 | 6 p. m. | [1] 3 | | 100,000 | Hail | Loss in 500 acres or more of tobacco and cotton, corn, and other crops; path 5 miles long. |

[1] Miles instead of yards.

## SEVERE LOCAL STORMS, MAY AND JUNE 1943—Continued

| Place | Date | Time | Width of path, yards | Loss of life | Value of property destroyed | Character of storm | Remarks |
|---|---|---|---|---|---|---|---|
| | *May* | | | | | | |
| Vance and Etawville, S. C. | 18 | 7 p. m. | 880 | | 25,000 | Thunderstorm | Property damage; loss in crops; path 6 miles long. |
| Fergus County, Mont. | 18 | 7:15 a. m. | [1] 30 | | 20,000 | Wind and hail | About $5,000 wind damage to crops; path 30 miles long. |
| Marion, S. C. | 18 | 8:30 p. m. | | | 10,500 | Electrical | 3 homes and Camp Lumbering Manufacturing Co. damaged by fire. |
| Richland County, Mont. | 18 | P. m. | [1] 2 | | 20,000 | Hail | Hail walnut size; small grains damaged; path 5 miles long. |
| McCone County, Mont. | 19 | 12:30 a. m. | [1] 4 | | 25,000 | Hail and wind | Path 15 miles long; no details. |
| Daniels County, Mont. | 19 | 10 p. m. | [1] 1 | | 12,000 | Light hail and rain. | $7,000 wind damage to threshing machine, combine, beans, and small buildings; loss from hail, $5,000; path 30 miles long. |
| International Falls, Minn., and vicinity. | 20 | Noon | [1] 30 | | 235,000 | Thundersqualls | Many poles and wires down; hundreds of trees broken or uprooted; buildings, docks, water-front installations damaged. |
| Valley County, Mont. | 21 | 8–10 a. m. | [1] 8 | | 10,000 | Heavy hail | Loss in wheat, flax, and other small grains. Path 20 miles long. |
| Teton County, Mont. | 21 | 7:30 p. m. | [1] 10 | | 3,000 | do | Winter wheat, alfalfa, and peas damaged; path 25 miles long. |
| Milwaukee, Wis. | 21 | 8 p. m. | | | 2,500 | Thundersquall | Property damaged; 6 persons injured. |
| Verdi, Iowa, vicinity of. | 21 | P. m. | | | 1,500 | Hail, rain, and wind. | Creeks flooded; fences washed out; small buildings blown over or damaged. |
| Barrett, Minn., and vicinity. | 22 | Noon | [1] 12 | | 10,000 | Thundersqualls | Number of barns, outbuildings, silos, and windmills wrecked; trees uprooted. |
| Shaw Field, Sumter County, S. C. | 22 | 2 p. m. | | | 500 | do | 40 training planes damaged; path 700 yards long. |
| Reno County, Kans. | 22 | 6 p. m. | | | 100,000 | Wind, heavy hail | This hail fell in 3 strips; 1 north of Partridge covering a territory of 4 by 6 miles; 1 east of Langdon covering a territory 2½ by 3½ miles, and 1 north of Yoder, covering a territory 3 by 3 miles. Most of the damage caused by hail. |
| Winnsboro, S. C. | 22 | 6:30–8 p. m. | | | 1,000 | Thundersquall | Transmission wires down; trees uprooted. |
| Chester, S. C., vicinity of. | 22 | P. m. | | | 3,000 | Electrical | Barn, livestock, and contents burned. |
| Clay, Wilkin, Becker, Ottertail, and Wadena Counties, Minn. | 24 | 5 a. m. | [1] 20 | | 50,000 | Hail | Light to heavy hail that accompanied a severe thunderstorm caused damage to growing crops in places. Storm moved from northwest to southeast over a path about 125 miles long. |
| Clay, Wilkin, Becker, Ottertail, and Wadena Counties, Minn. | 24 | do | [1] 20 | | 80,000 | Thundersqualls | More than 20 barns, outbuildings, silos and windmills demolished; many farm buildings damaged; communication and electric service disrupted; some livestock, much poultry and many bees perished; trees uprooted or branches broken off; loss in growing crops. |
| Lyon, Osceola, Sioux, O'Brien, and Clay Counties, Iowa. | 24 | 7:15–8 p. m. | [1] 8 | | 750,000 | Wind, hail, and rain. | This severe wind storm traveled southeastward from the Minnesota border, wrecking barns and other farm buildings, blowing down trees and telephone and electric lines and causing other damage over a path 50 or 6 miles long in Iowa. Heavy rain flooded small streams and washed fields. |
| Chouteau County, Mont. | 24 | 8:50 p. m. | [1] 9 | | 25,000 | Hail | Loss in wheat, oats and flax; path 25 miles long. |
| Sac City, Iowa. | 24 | P. m. | | | 12,000 | Electrical | 3 large barns and their contents destroyed after being struck by lightning. |
| Lakefield, Minn. | 24 | do | [1] 3 | | 10,500 | Hail | Light to heavy hail that accompanied a severe thunderstorm caused much damage to growing crops in places. Loss to growing crops in Jackson County estimated as $10,000. |
| Blaine County, Mont. | 25 | 2 a. m. | 880 | | 1,000 | do | Path 12 miles long, no details. |
| Daniels County, Mont. | 25 | 10:30 a. m. | [1] 2 | | 15,000 | do | Loss in barley, wheat, and flax; path 6 miles long. |
| Teton County, Mont. | 25 | 4:30 p. m. | | | 70,000 | do | Loss in winter wheat, oats, barley, and spring wheat. |
| Fergus County, Mont. | 25 | 6:30 p. m. | [1] 3 | | 150,000 | do | Loss in wheat, gardens, spring grain, and hay. About 4,000 windows out in Lewistown; path 30 miles long. |
| Choteau County, Mont. | 25 | 7 p. m. | [1] 1 | | 150,000 | do | Chief loss in wheat; path 20 miles long. |
| Meade County, S. Dak. | 25 | do | [1] 20 | 1 | 10,000 | Wind | Several boxcars moved; 1 person injured; path 100 miles long. |
| Big Stone, Traverse, Ottertail, and Crow Wing Counties, Minn. | 25–26 | 11 p. m.–4:30 a. m. | 55 | | 35,000 | Thundersqualls | Number of barns, outbuildings, silos, and windmills demolished; houses moved from their foundations; poles and wires down, trees uprooted, several automobiles wrecked, some livestock perished, haystacks scattered and growing crops damaged. |
| Treasure County, Mont. | 26 | 12:15–1:15 a. m. | [1] 15 | | | Heavy hail | About 80 to 90 percent of wheat lost; considerable property damaged; path 40 miles long; estimate not given. |
| Dawson County, Mont. | 30 | 6 p. m. | [1] 2 | | 20,000 | Hail | Loss in wheat, oats, barley, and beans; path 20 miles long. |
| Carlsbad, N. Mex., and vicinity. | 30 | | | | 15,000 | Rain and hail | Loss in cotton. |

[1] Miles instead of yards.

# SOLAR RADIATION AND SUNSPOT DATA FOR JUNE 1943

[Solar Radiation Investigations Section, I. F. HAND in charge]

## SOLAR RADIATION OBSERVATIONS

Explanations of the tables and references to descriptions of instruments, stations and methods of observation, and to summaries of data, are given in the January 1942 REVIEW, page 20; a list of pyrheliometric stations is also given in the REVIEW for January 1943, page 12.

TABLE 1.—*Solar radiation intensities during June 1943*

[Gram calories per minute per square centimeter of normal surface]

### MADISON, WIS.

| Date | Sun's zenith distance: 7:30 a. m. | 78.7° | 75.7° | 70.7° | 60.0° | 0.0° | 60.0° | 70.7° | 75.7° | 78.7° | 1:30 p. m. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 75th mer. time | Air mass: A. M. | | | | P. M. | | | | | Local mean solar time |
| | e. | 5.0 | 4.0 | 3.0 | 2.0 | *1.0 | 2.0 | 3.0 | 4.0 | 5.0 | e. |
| | *mb.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *mb.* |
| June 4 | 19.2 | ------ | ------ | 0.83 | 0.99 | 1.34 | ------ | ------ | ------ | ------ | 10.6 |
| June 6 | 13.2 | 0.69 | 0.81 | .94 | 1.11 | ------ | ------ | ------ | ------ | ------ | 13.2 |
| June 17 | 17.0 | .75 | .83 | .95 | 1.08 | ------ | ------ | ------ | ------ | ------ | 17.0 |
| June 18 | 15.3 | .68 | .77 | .92 | 1.07 | 1.35 | ------ | ------ | ------ | ------ | 17.0 |
| June 19 | 19.6 | .58 | .68 | .83 | 1.03 | 1.27 | ------ | ------ | ------ | ------ | 19.6 |
| June 21 | 23.3 | .58 | .68 | .79 | 1.01 | 1.24 | ------ | ------ | ------ | ------ | 28.6 |
| June 29 | 10.2 | .84 | .95 | 1.08 | 1.22 | ------ | ------ | ------ | ------ | ------ | 10.1 |
| June 30 | 10.6 | .76 | .86 | .95 | 1.11 | 1.40 | ------ | ------ | ------ | ------ | 9.8 |
| Means | ------ | .70 | .80 | .91 | 1.06 | 1.32 | ------ | ------ | ------ | ------ | ------ |
| Departures | ------ | +.02 | −.02 | −.04 | +.03 | −.01 | ------ | ------ | ------ | ------ | ------ |

### LINCOLN, NEBR.

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| June 2 | 25.0 | ------ | ------ | ------ | ------ | ------ | 1.17 | 1.03 | 0.82 | 0.45 | 21.1 |
| June 3 | 15.8 | ------ | ------ | ------ | ------ | ------ | 1.19 | 0.97 | .84 | .73 | 10.6 |
| June 17 | 14.8 | ------ | ------ | ------ | ------ | 1.41 | 1.12 | .90 | .79 | .69 | 13.4 |
| June 18 | 17.7 | ------ | ------ | ------ | ------ | 1.31 | 1.01 | .81 | .73 | .66 | 21.8 |
| June 24 | 23.4 | ------ | ------ | ------ | ------ | 1.25 | .97 | .77 | .67 | .58 | 24.1 |
| June 29 | 11.4 | ------ | ------ | ------ | ------ | ------ | 1.12 | .94 | .84 | .75 | 10.2 |
| Means | ------ | ------ | ------ | ------ | ------ | 1.32 | 1.10 | .90 | .78 | .64 | ------ |
| Departures | ------ | ------ | ------ | ------ | ------ | −.04 | .00 | −.01 | .00 | −.01 | ------ |

*Extrapolated.

TABLE 1.—*Solar radiation intensities during June 1943*—Continued

### BLUE HILL, MASS.

| Date | Sun's zenith distance: 7:30 a. m. | 78.7° | 75.7° | 70.7° | 60.0° | 0.0° | 60.0° | 70.7° | 75.7° | 78.7° | 1:30 p. m. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 75th mer. time | Air mass: A. M. | | | | P. M. | | | | | Local mean solar time |
| | e. | 5.0 | 4.0 | 3.0 | 2.0 | *1.0 | 2.0 | 3.0 | 4.0 | 5.0 | e. |
| | *mb.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *mb.* |
| June 3 | 22.6 | 0.66 | 0.75 | 0.87 | ------ | ------ | ------ | ------ | ------ | ------ | 14.2 |
| June 4 | 15.4 | ------ | ------ | .43 | 0.66 | ------ | 0.50 | 0.30 | ------ | ------ | 16.5 |
| June 5 | 21.8 | ------ | ------ | .76 | .89 | ------ | 1.13 | .99 | 0.85 | 0.75 | 9.1 |
| June 6 | 10.2 | .81 | .89 | .99 | 1.09 | ------ | ------ | .85 | .71 | .60 | 9.5 |
| June 10 | 14.8 | .52 | .64 | .77 | ------ | ------ | ------ | ------ | ------ | ------ | 8.4 |
| June 12 | 13.2 | .65 | .72 | .80 | ------ | ------ | ------ | .64 | .56 | .47 | 14.8 |
| June 14 | 15.4 | ------ | ------ | .83 | 1.01 | ------ | ------ | ------ | ------ | ------ | 16.5 |
| June 18 | 20.4 | ------ | ------ | ------ | ------ | ------ | 1.06 | ------ | .77 | .69 | 13.2 |
| June 23 | 13.2 | ------ | .83 | .98 | 1.12 | 1.34 | ------ | ------ | ------ | .65 | 13.7 |
| June 24 | 16.5 | ------ | ------ | ------ | ------ | ------ | ------ | .55 | .41 | .34 | 20.4 |
| June 25 | 23.4 | .53 | .64 | .80 | .96 | 1.24 | ------ | .47 | .27 | .15 | 20.4 |
| June 30 | 11.8 | .78 | .94 | 1.06 | 1.17 | ------ | ------ | ------ | ------ | ------ | 11.4 |
| Means | ------ | .66 | .77 | .83 | .99 | (1.29) | .90 | .63 | .60 | .52 | ------ |
| Departures | ------ | −.02 | −.02 | −.08 | −.06 | −.01 | −.14 | −.22 | −.05 | −.01 | ------ |

### ALBUQUERQUE, NEW MEXICO

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| June 4 | 5.8 | ------ | 0.98 | 1.10 | ------ | ------ | ------ | ------ | ------ | ------ | 5.4 |
| June 6 | 5.4 | ------ | 1.00 | 1.11 | 1.26 | 1.44 | 1.15 | ------ | ------ | ------ | 5.4 |
| June 7 | 4.4 | ------ | .85 | 0.97 | 1.14 | 1.48 | 1.05 | ------ | ------ | ------ | 6.8 |
| June 8 | 9.1 | ------ | .89 | .99 | 1.12 | 1.42 | ------ | ------ | ------ | ------ | 6.8 |
| June 9 | 6.8 | ------ | ------ | 1.01 | ------ | ------ | ------ | ------ | ------ | ------ | 9.5 |
| June 11 | 13.2 | ------ | ------ | 1.08 | 1.20 | 1.47 | ------ | ------ | ------ | ------ | 8.1 |
| June 14 | 5.1 | 0.98 | 1.03 | 1.15 | 1.25 | 1.47 | ------ | ------ | ------ | ------ | 5.4 |
| June 16 | 6.1 | ------ | ------ | 1.13 | 1.28 | 1.47 | ------ | ------ | ------ | ------ | 4.7 |
| June 17 | 8.8 | .74 | .80 | .92 | ------ | ------ | ------ | ------ | ------ | ------ | 8.1 |
| June 19 | 9.1 | ------ | .81 | .96 | ------ | ------ | ------ | ------ | ------ | ------ | 9.8 |
| June 20 | 6.8 | ------ | .80 | ------ | ------ | ------ | ------ | ------ | ------ | ------ | 6.1 |
| June 21 | 5.1 | ------ | .91 | 1.01 | 1.18 | ------ | ------ | ------ | ------ | ------ | 6.8 |
| June 22 | 4.7 | .85 | 1.04 | 1.05 | 1.19 | 1.38 | 1.17 | 1.02 | ------ | ------ | 6.8 |
| June 23 | 5.4 | ------ | .88 | ------ | ------ | 1.40 | 1.05 | 0.91 | 0.68 | 0.60 | 6.4 |
| June 24 | 7.8 | ------ | .75 | .82 | 1.05 | 1.48 | ------ | ------ | ------ | ------ | 6.4 |
| June 25 | 8.5 | .90 | .98 | 1.11 | ------ | ------ | ------ | ------ | ------ | ------ | 8.1 |
| June 27 | 12.9 | .73 | .81 | .93 | 1.10 | 1.39 | ------ | ------ | ------ | ------ | 12.9 |
| Means | ------ | .84 | .90 | 1.02 | 1.18 | 1.44 | 1.10 | (.96) | (.68) | (.60) | ------ |
| Departures | ------ | −.04 | −.05 | −.04 | −.04 | −.01 | −.13 | −.13 | −.28 | −.29 | ------ |

TABLE 2.—*Daily totals and weekly means of solar radiation (direct+diffuse) received on a horizontal surface*

[Gram-calories per square centimeter]

| Date | Washington | Madison | Lincoln | East Lansing | New York | Fairbanks | Nashville | Twin Falls | La Jolla | New Orleans | Riverside | Blue Hill | Newport | State College | Put-in-Bay | East Wareham | Fresno | Davis, Calif. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1943 | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* |
| June 4 | 682 | 732 | 696 | 536 | 574 | 580 | 444 | 270 | 584 | 528 | 543 | 618 | 631 | 522 | 600 | 609 | 725 | 787 |
| June 5 | 628 | 209 | 68 | 631 | 710 | 352 | 698 | 699 | 459 | 641 | 651 | 718 | 754 | 706 | 745 | 702 | 727 | 772 |
| June 6 | 253 | 123 | 193 | 239 | 679 | 316 | 637 | 522 | 590 | ------- | 689 | 733 | 741 | 580 | 285 | 740 | 719 | 788 |
| June 7 | 561 | 554 | 61 | 172 | 106 | 430 | 580 | 727 | ------- | 667 | 634 | 173 | 78 | 289 | 269 | 92 | 718 | 776 |
| June 8 | ------- | 377 | 224 | 376 | 496 | 666 | 486 | 632 | 362 | ------- | 611 | 632 | 682 | 182 | 658 | 609 | 670 | 741 |
| June 9 | ------- | 466 | 202 | 719 | 139 | 691 | 581 | 639 | 620 | 645 | 520 | 532 | 438 | 68 | 744 | 535 | 690 | 762 |
| June 10 | ------- | 725 | 502 | 564 | 412 | 654 | 537 | 708 | 500 | ------- | 555 | 656 | 720 | 241 | 535 | 708 | 669 | 647 |
| **Mean** | **531** | **455** | **278** | **463** | **445** | **570** | **566** | **599** | **519** | **615** | **600** | **566** | **578** | **370** | **548** | **571** | **703** | **753** |
| **Departure** | **+21** | **−56** | **−244** | ------- | **−47** | **+67** | **+22** | **+12** | **−15** | **+141** | **+64** | **+41** | **+18** | **−96** | ------- | ------- | **+30** | ------- |
| June 11 | 421 | 220 | 643 | 578 | 635 | 650 | 583 | 241 | 244 | ------- | 314 | 570 | 626 | 639 | 642 | 520 | 727 | 735 |
| June 12 | 482 | 585 | 714 | 572 | 472 | 450 | 599 | 531 | 472 | ------- | 198 | 698 | 718 | 554 | 666 | 725 | 587 | 649 |
| June 13 | 574 | 582 | 570 | 707 | 386 | 590 | 385 | 350 | 598 | 496 | 549 | 376 | 254 | 510 | 705 | 200 | 716 | 769 |
| June 14 | 667 | 609 | 749 | 515 | 622 | 584 | 542 | 574 | 747 | 653 | 679 | 704 | 696 | 732 | 538 | 732 | 721 | 799 |
| June 15 | 577 | 532 | 770 | 561 | 490 | 571 | 575 | 598 | 730 | 509 | 627 | 614 | 587 | 357 | 602 | 610 | 717 | 806 |
| June 16 | 477 | 267 | 737 | 287 | 614 | 603 | 679 | 743 | 720 | ------- | 650 | 495 | 605 | 647 | 531 | 561 | 702 | 796 |
| June 17 | 636 | 599 | 616 | 566 | 236 | 518 | 657 | 717 | 618 | ------- | 652 | 570 | 528 | 545 | 668 | 587 | 695 | 776 |
| **Mean** | **548** | **485** | **671** | **541** | **494** | **567** | **574** | **536** | **590** | ------- | **524** | **575** | **573** | **569** | **622** | **571** | **695** | **762** |
| **Departure** | **+45** | **−20** | **+136** | ------- | **+6** | **+58** | **+35** | **−76** | **+44** | ------- | **−41** | **+89** | **+75** | **+70** | ------- | ------- | **+2** | ------- |
| June 18 | 692 | 713 | 442 | 734 | 603 | 702 | 701 | 655 | 538 | ------- | 660 | 578 | 629 | 595 | 731 | 567 | 709 | 730 |
| June 19 | 735 | 716 | 740 | 707 | 669 | 689 | 681 | 392 | 449 | 587 | 686 | 478 | 597 | 673 | 707 | 468 | 727 | 747 |
| June 20 | 691 | 381 | 729 | 590 | 526 | 677 | 626 | 733 | 581 | 576 | 686 | 542 | 664 | 597 | 644 | 581 | 726 | 736 |
| June 21 | 681 | 693 | 757 | 553 | 535 | 705 | 608 | 737 | 755 | 499 | 664 | 649 | 701 | 580 | 600 | 678 | 625 | 566 |
| June 22 | 649 | 673 | 642 | 703 | 467 | 712 | 584 | 596 | 734 | 512 | 662 | 615 | 603 | 641 | 727 | 558 | 749 | 824 |
| June 23 | 693 | 581 | 592 | 693 | 635 | 700 | 592 | 720 | 706 | 530 | 685 | 746 | 779 | 696 | 726 | 750 | 754 | 807 |
| June 24 | 601 | 521 | 705 | 664 | 538 | 609 | 533 | 744 | 698 | 546 | 682 | 636 | 710 | 580 | 611 | 692 | 750 | 819 |
| **Mean** | **678** | **611** | **658** | **663** | **568** | **685** | **618** | **654** | **637** | **542** | **675** | **606** | **669** | **623** | **678** | **613** | **720** | **747** |
| **Departure** | **+175** | **+74** | **+81** | ------- | **+70** | **+143** | **+66** | **−22** | **+36** | **+82** | **+72** | **+54** | **+93** | **+82** | ------- | ------- | **+4** | ------- |
| June 25 | 680 | 569 | 669 | 617 | 556 | 479 | 682 | 742 | 687 | 522 | 680 | 674 | 663 | 618 | 626 | 647 | 749 | 817 |
| June 26 | 626 | 648 | 717 | 438 | 433 | 547 | 590 | 737 | 738 | 404 | 643 | 507 | 671 | 537 | 446 | 606 | 754 | 807 |
| June 27 | 601 | 488 | 708 | 402 | 552 | 559 | 384 | 737 | ------- | 479 | 653 | 592 | 618 | 557 | 560 | 628 | 737 | 817 |
| June 28 | 652 | 652 | 740 | 462 | 536 | 572 | 401 | 709 | ------- | 410 | 643 | 524 | 616 | 537 | 479 | 567 | 723 | 784 |
| June 29 | 331 | 386 | 765 | 479 | 142 | 554 | 459 | 621 | 679 | 627 | 646 | 130 | 184 | 454 | 660 | 166 | 729 | 804 |
| June 30 | 732 | 770 | 241 | 708 | 636 | 479 | 757 | 624 | 646 | 428 | 663 | 624 | 767 | 414 | 748 | 675 | 718 | 780 |
| July 1 | 872 | 580 | 469 | 598 | 645 | 672 | 679 | 707 | 633 | 444 | 650 | 667 | 781 | 667 | 735 | 687 | 705 | 766 |
| **Mean** | **642** | **585** | **616** | **529** | **500** | **552** | **565** | **697** | **677** | **474** | **654** | **531** | **614** | **540** | **608** | **568** | **731** | **796** |
| **Departure** | **+112** | **+48** | **+28** | ------- | **+13** | **+88** | **+34** | **+64** | **+105** | **+26** | **+67** | **+28** | **+48** | **+20** | ------- | ------- | **+31** | ------- |

**ACCUMULATED DEPARTURES ON JULY 1, 1943**

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **+2765** | **+518** | **+2744** | ------- | **−3010** | **+931** | **+539** | **+133** | **−3647** | ------- | **−483** | **−2016** | **−329** | **−2450** | ------- | ------- | ------- | ------- |

## POSITIONS, AREAS, AND COUNTS OF SUNSPOTS FOR JUNE 1943

[Communicated by Capt. J. F. Hellweg, U. S. N. (Ret.), Superintendent, U. S. Naval Observatory.] All measurements and spot counts were made at the Naval Observatory from plates taken at the observatories indicated. Difference in longitude is measured from the central meridian, positive toward the west. Latitude is positive toward the north. Areas are corrected for foreshortening and expressed in millionths of Sun's hemisphere. For each day, under longitude, latitude, area of spot or group, and spot count, are included assumed longitude of center of the disk, assumed latitude of center of the disk, total area of spots and groups, and total spot count.

| Date | Eastern standard time | Mount Wilson group No. | Heliographic: Difference in longitude | Heliographic: Longitude | Heliographic: Latitude | Heliographic: Distance from center of disk | Area of spot or group | Spot count | Plate quality | Observatory |
|---|---|---|---|---|---|---|---|---|---|---|
| *1943* | *h m* | | ° | ° | ° | ° | | | | |
| June 1 | 8 54 | 7581 | +24 | 298 | +5 | 25 | 6 | 1 | G | Mt. Wilson. |
| | | 7581 | +31 | 305 | +3 | 31 | 12 | 2 | | |
| | | 7580 | +34 | 308 | +6 | 35 | 6 | 1 | | |
| | | | | (274) | (−1) | | 24 | 4 | | |
| 2 | 10 11 | | | No spots | | | | | F | Do. |
| 3 | 10 41 | (*) | −80 | 167 | −36 | 80 | 6 | 1 | VG | U. S. Naval. |
| | | (*) | +52 | 299 | +8 | 53 | 12 | 1 | | |
| | | (*) | +55 | 302 | +7 | 56 | 6 | 1 | | |
| | | (*) | +58 | 305 | +6 | 59 | 6 | 1 | | |
| | | | | (247) | (0) | | 30 | 4 | | |
| 4 | 10 15 | | | No spots | | | | | G | Mt. Wilson. |
| 5 | 11 29 | | | No spots | | | | | G | U. S. Naval. |
| 6 | 8 54 | (*) | −38 | 170 | −35 | 50 | 6 | 1 | VG | Mt. Wilson. |
| | | | | (208) | (0) | | 6 | 1 | | |

## POSITIONS, AREAS, AND COUNTS OF SUNSPOTS FOR JUNE 1943—Continued

| Date | Eastern standard time | Mount Wilson group No. | Heliographic: Difference in longitude | Heliographic: Longitude | Heliographic: Latitude | Heliographic: Distance from center of disk | Area of spot or group | Spot count | Plate quality | Observatory |
|---|---|---|---|---|---|---|---|---|---|---|
| *1943* | *h m* | | ° | ° | ° | ° | | | | |
| 7 | 11 43 | 7583 | −87 | 106 | +9 | 87 | 97 | 1 | F | U. S. Naval. |
| | | 7583 | −81 | 112 | +9 | 81 | 24 | 1 | | |
| | | | | (193) | (0) | | 121 | 2 | | |
| 8 | 14 51 | 7583 | −72 | 106 | +9 | 72 | 97 | 1 | F | Do. |
| | | 7582 | −20 | 158 | −38 | 42 | 6 | 1 | | |
| | | | | (178) | (0) | | 103 | 2 | | |
| 9 | 8 34 | 7583 | −60 | 109 | +9 | 61 | 109 | 1 | VG | Mt. Wilson. |
| | | | | (169) | (0) | | 109 | 1 | | |
| 10 | 8 35 | 7583 | −47 | 108 | +9 | 48 | 97 | 1 | VG | Do. |
| | | | | (155) | (0) | | 97 | 1 | | |
| 11 | 12 6 | 7583 | −33 | 107 | +9 | 34 | 97 | 1 | F | U. S. Naval. |
| | | | | (140) | (+1) | | 97 | 1 | | |
| 12 | 11 52 | 7584 | −58 | 69 | +15 | 59 | 48 | 5 | VG | Do. |
| | | 7583 | −19 | 108 | +9 | 20 | 73 | 1 | | |
| | | | | (127) | (+1) | | 121 | 6 | | |
| 13 | 11 36 | 7584 | −46 | 68 | +15 | 48 | 48 | 3 | P | Do. |
| | | 7583 | −6 | 108 | +9 | 10 | 73 | 1 | | |
| | | | | (114) | (+1) | | 121 | 4 | | |

## POSITIONS, AREAS, AND COUNTS OF SUNSPOTS FOR JUNE 1943—Continued

| Date | Eastern Standard time | Mount Wilson group No. | Heliographic | | | | Area of spot or group | Spot count | Plate quality | Observatory |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Difference in longitude | Longitude | Latitude | Distance from center of disk | | | | |
| *1943* | h m | | ° | ° | ° | ° | | | | |
| 14 | 10 44 | 7584 | −32 | 69 | +14 | 34 | 48 | 13 | VG | Do. |
| | | 7583 | +8 | 109 | +8 | 12 | 73 | 2 | | |
| | | (*) | +15 | 116 | +13 | 19 | 12 | 4 | | |
| | | (*) | +18 | 119 | +17 | 23 | 24 | 1 | | |
| | | | | (101) | (+1) | | 157 | 20 | | |
| 15 | 10 39 | 7584 | −18 | 70 | +14 | 22 | 24 | 6 | G | Do. |
| | | 7583 | +20 | 108 | +8 | 21 | 48 | 2 | | |
| | | 7585 | +52 | 140 | +6 | 42 | 6 | 2 | | |
| | | (*) | +65 | 153 | −41 | 73 | 6 | 1 | | |
| | | | | (88) | (+1) | | 84 | 11 | | |
| 16 | 11 36 | 7584 | −4 | 70 | +13 | 13 | 48 | 13 | VG | Do. |
| | | 7583 | +34 | 108 | +8 | 35 | 36 | 3 | | |
| | | | | (74) | (+1) | | 84 | 16 | | |
| 17 | 10 51 | 7584 | +11 | 72 | +13 | 17 | 48 | 10 | G | Do. |
| | | 7586 | +40 | 101 | −1 | 40 | 48 | 2 | | |
| | | 7583 | +48 | 109 | +8 | 49 | 36 | 1 | | |
| | | | | (61) | (+1) | | 132 | 13 | | |
| 18 | 10 42 | 7584 | +24 | 72 | +13 | 27 | 388 | 1 | G | Do. |
| | | 7586 | +52 | 100 | −1 | 52 | 12 | 2 | | |
| | | | | (48) | (+1) | | 400 | 3 | | |
| 19 | 8 34 | | | No spots | | | | | F | Mt. Wilson. |
| 20 | 11 28 | | | No spots | | | | | F | Do. |
| 21 | 11 28 | | | No spots | | | | | VG | U. S. Naval. |
| 22 | 11 24 | 7587 | −23 | 332 | −2 | 24 | 24 | 3 | VG | Do. |
| | | | | (355) | (+2) | | 24 | 3 | | |
| 23 | 10 44 | 7587 | −10 | 332 | −2 | 11 | 97 | 10 | VG | U. S. Naval |
| | | | | (342) | (+2) | | 97 | 10 | | |
| 24 | 10 55 | 7587 | +4 | 333 | −2 | 6 | 73 | 4 | G | Do. |
| | | | | (329) | (+2) | | 73 | 4 | | |
| 25 | 11 20 | 7587 | +18 | 333 | −2 | 19 | 48 | 1 | G | Do. |
| | | | | (315) | (+2) | | 48 | 1 | | |
| 26 | 10 35 | 7587 | +32 | 334 | −2 | 32 | 48 | 3 | VG | Do. |
| | | | | (302) | (+2) | | 48 | 3 | | |
| 27 | 11 39 | 7587 | +46 | 335 | −2 | 46 | 24 | 3 | VG | Do. |
| | | | | (289) | (+2) | | 24 | 3 | | |
| 28 | 10 44 | 7587 | +60 | 336 | −2 | 60 | 12 | 4 | F | Do. |
| | | | | (276) | (+3) | | 12 | 4 | | |
| 29 | 8 20 | | | No spots | | | | | VG | Mt. Wilson |
| 30 | 11 25 | 7588 | +37 | 280 | +11 | 38 | 24 | 7 | VG | U. S. Naval |
| | | | | (249) | (+3) | | 24 | 7 | | |

Mean daily area for 30 days = 68.

*Not numbered.
VG=very good; G=good; F=fair; P=poor.

## PROVISIONAL RELATIVE SUNSPOT NUMBERS FOR FEBRUARY 1943

[Based on observations at Zurich. Data furnished through the courtesy of Prof. W. Brunner, Swiss Federal Observatory, Zurich, Switzerland]

| February 1943 | Relative numbers | February 1943 | Relative numbers | February 1943 | Relative numbers |
|---|---|---|---|---|---|
| 1 | 10 | 11 | *b* 37 | 21 | *Ec* 31 |
| 2 | * 11 | 12 | 31 | 22 | *Mc* 54 |
| 3 | 20 | 13 | 21 | 23 | 62 |
| 4 | 16 | 14 | 29 | 24 | 60 |
| 5 | 7 | 15 | 16 | 25 | *b* 63 |
| 6 | 0 | 16 | 16 | 26 | 61 |
| 7 | | 17 | 11 | 27 | 50 |
| 8 | *Ecc* 25 | 18 | *Ec* 15 | 28 | 56 |
| 9 | 38 | 19 | 11 | | |
| 10 | 37 | 20 | *d* 20 | | |

Mean, 27 days=29.9

(*)=Observed at Arosa.
*a*=Passage of an average-sized group through the central meridian.
*b*=Passage of a large group through the central meridian.
*c*=New formation of a group developing into a middle-sized or large center of activity: E, on the eastern part of the sun's disk; W, on the western part; M, in the central-circle zone.
*d*=Entrance of a large or average-sized center of activity on the east limb.

## PROVISIONAL RELATIVE SUNSPOT NUMBERS FOR MARCH 1943

[Based on observations at Zurich. Data furnished through the courtesy of Prof. W Brunner, Swiss Federal Observatory, Zurich, Switzerland]

| March 1943 | Relative numbers | March 1943 | Relative numbers | March 1943 | Relative numbers |
|---|---|---|---|---|---|
| 1 | 46 | 11 | 53 | 21 | *Ec* 37 |
| 2 | 38 | 12 | 46 | 22 | 25 |
| 3 | 16 | 13 | 44 | 23 | 35 |
| 4 | *d* 10 | 14 | 21 | 24 | *a* 34 |
| 5 | 16 | 15 | 29 | 25 | *a* 28 |
| 6 | 19 | 16 | 11 | 26 | 25 |
| 7 | 37 | 17 | 0 | 27 | 24 |
| 8 | 32 | 18 | *d* 10 | 28 | 20 |
| 9 | 39 | 19 | 11 | 29 | * 10? |
| 10 | *b* 39 | 20 | 21 | 30 | *Mc* 25 |
| | | | | 31 | *d* 33 |

Mean, 31 days=26.9

*=Observed at Locarno.
*a*=Passage of an average-sized group through the central meridian.
*b*=Passage of a large group through the central meridian.
*c*=New formation of a group developing into a middle-sized or large center of activity: E, on the eastern part of the sun's disk; W, on the western part; M, in the central-circle zone.
*d*=Entrance of a large or average-sized center of activity on the east limb.

543645—43——3

## PROVISIONAL RELATIVE SUNSPOT NUMBERS FOR APRIL 1943

[Based on observations at Zurich, except as noted. Data furnished through the courtesy of Prof. W. Brunner, Swiss Federal Observatory, Zurich, Switzerland]

| April 1943 | Relative numbers | April 1943 | Relative numbers | April 1943 | Relative numbers |
|---|---|---|---|---|---|
| 1 | *a 25 | 11 | 31 | 21 | b 38 |
| 2 | 22 | 12 | 33 | 22 | 45 |
| 3 | 22 | 13 | 20 | 23 | 41 |
| 4 | 30 | 14 | a 20 | 24 | 36 |
| 5 | 24 | 15 | d 28 | 25 | 34 |
| 6 | a 24 | 16 | 27 | 26 | 22 |
| 7 | * 12 | 17 | 32 | 27 | d 20 |
| 8 | 14 | 18 | 35 | 28 | 8 |
| 9 | d 19 | 19 | 41 | 29 | 10 |
| 10 | 26 | 20 | * 37 | 30 | 10 |

Mean, 30 days=26.2

*=Observed at Locarno.
a=Passage of an average-sized group through the central meridian.
b=Passage of a large group through the central meridian.
c=New formation of a group developing into a middle-sized or large center of activity: E, on the eastern part of the sun's disk; W, on the western part; M, in the central-circle zone.
d=Entrance of a large or average-sized center of activity on the east limb.

## PROVISIONAL RELATIVE SUNSPOT NUMBERS FOR MAY 1943

[Based on observations at Zurich. Data furnished through the courtesy of Prof. W. Brunner, Swiss Federal Observatory, Zurich, Switzerland]

| May 1943 | Relative numbers | May 1943 | Relative numbers | May 1943 | Relative numbers |
|---|---|---|---|---|---|
| 1 | 9 | 11 | d 7 | 21 | 13 |
| 2 | 13 | 12 | 13 | 22 | 13 |
| 3 | a— | 13 | 14 | 23 | 10 |
| 4 | * 9 | 14 | 17 | 24 | d 10 |
| 5 | 8 | 15 | 14 | 25 | * 10 |
| 6 | 8 | 16 | Wc 12 | 26 | 10 |
| 7 | 8 | 17 | a 37 | 27 | 11 |
| 8 | 8 | 18 | 47 | 28 | 9 |
| 9 | — | 19 | 34 | 29 | 9 |
| 10 | 7 | 20 | 20 | 30 | 9 |
| | | | | 31 | 10 |

Mean, 29 days=13.8

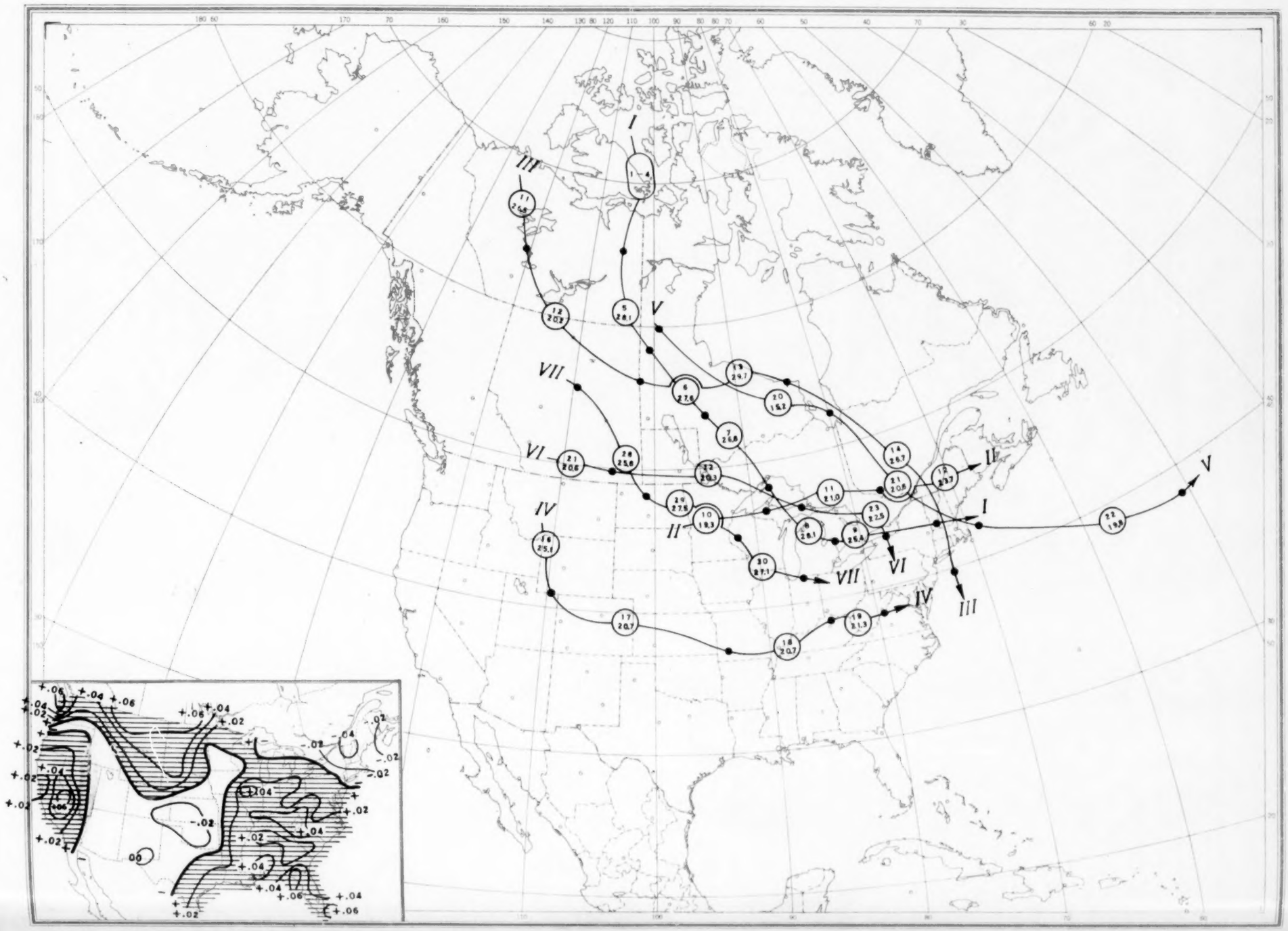
*=Observed at Locarno.
a=Passage of an average-sized group through the central meridian.
b=Passage of a large group through the central meridian.
c=New formation of a group developing into a middle-sized or large center of activity: E, on the eastern part of the sun's disk; W, on the western part; M, in the central-circle zone.
d=Entrance of a large or average-sized center of activity on the east limb.

Chart I. Departure (°F.) of the Mean Temperature from the Normal, and Wind Roses for Selected Stations, June 1943

Chart I. Departure (°F.) of the Mean Temperature from the Normal, and Wind Roses for Selected Stations, June 1943

HOURLY PERCENTAGES
Shaded portions show excess (+)
Unshaded portions show deficiency (−)
Lines show amount of excess or deficiency

Chart II. Tracks of Centers of Anticyclones, June 1943. (Inset) Departure of Monthly Mean Pressure from Normal



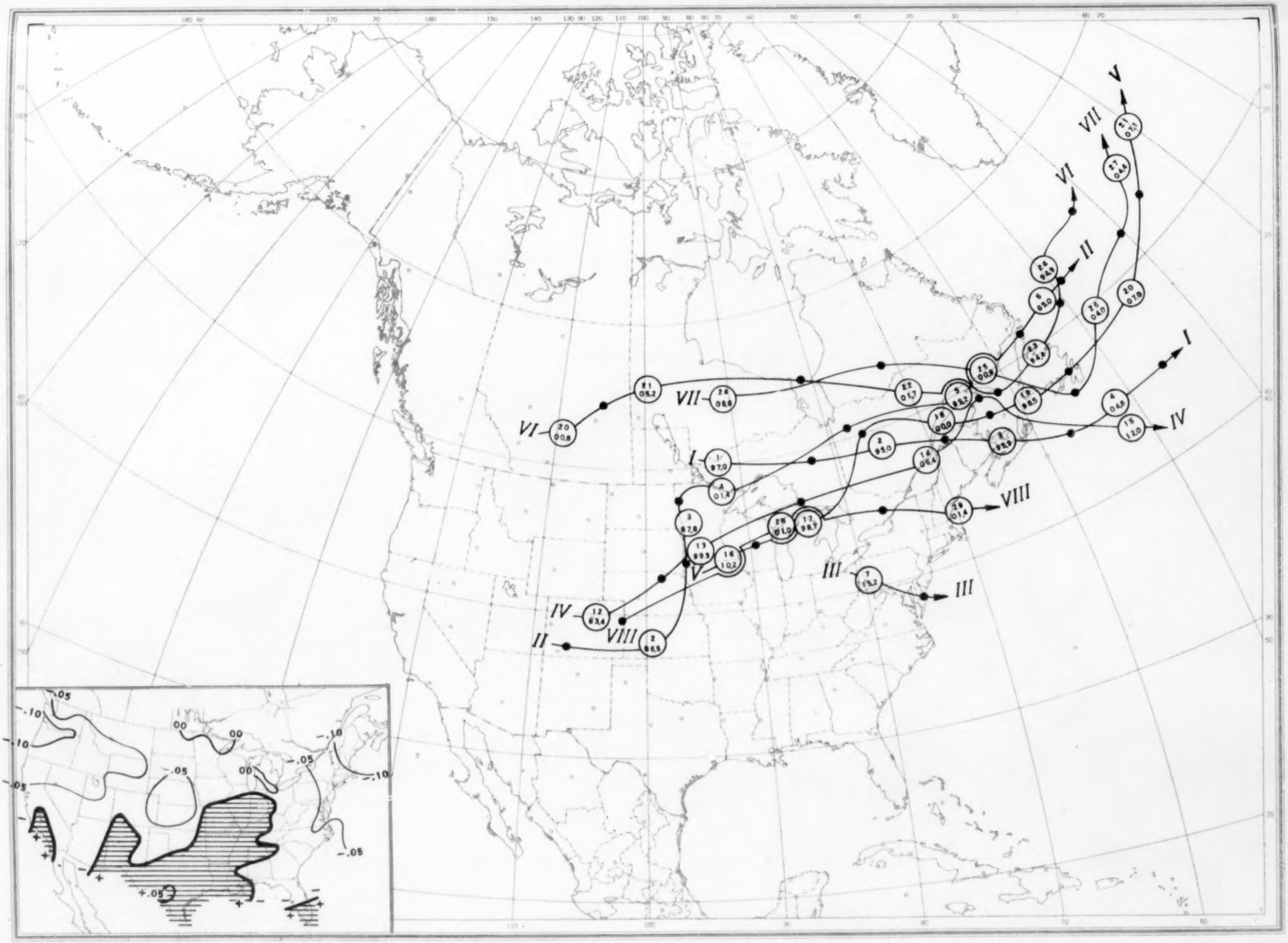

Circle indicates position of anticyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of anticyclone at 7:30 p. m. (75th meridian time)



Chart III. Tracks of Centers of Cyclones, June 1943. (Inset) Change in Mean Pressure from Preceding Month

Circle indicates position of anticyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of anticyclone at 7:30 p. m. (75th meridian time)

## Chart III. Tracks of Centers of Cyclones, June 1943. (Inset) Change in Mean Pressure from Preceding Month




Circle indicates position of cyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of cyclone at 7:30 p. m. (75th meridian time).

Chart IV. Percentage of Clear Sky Between Sunrise and Sunset, June 1943

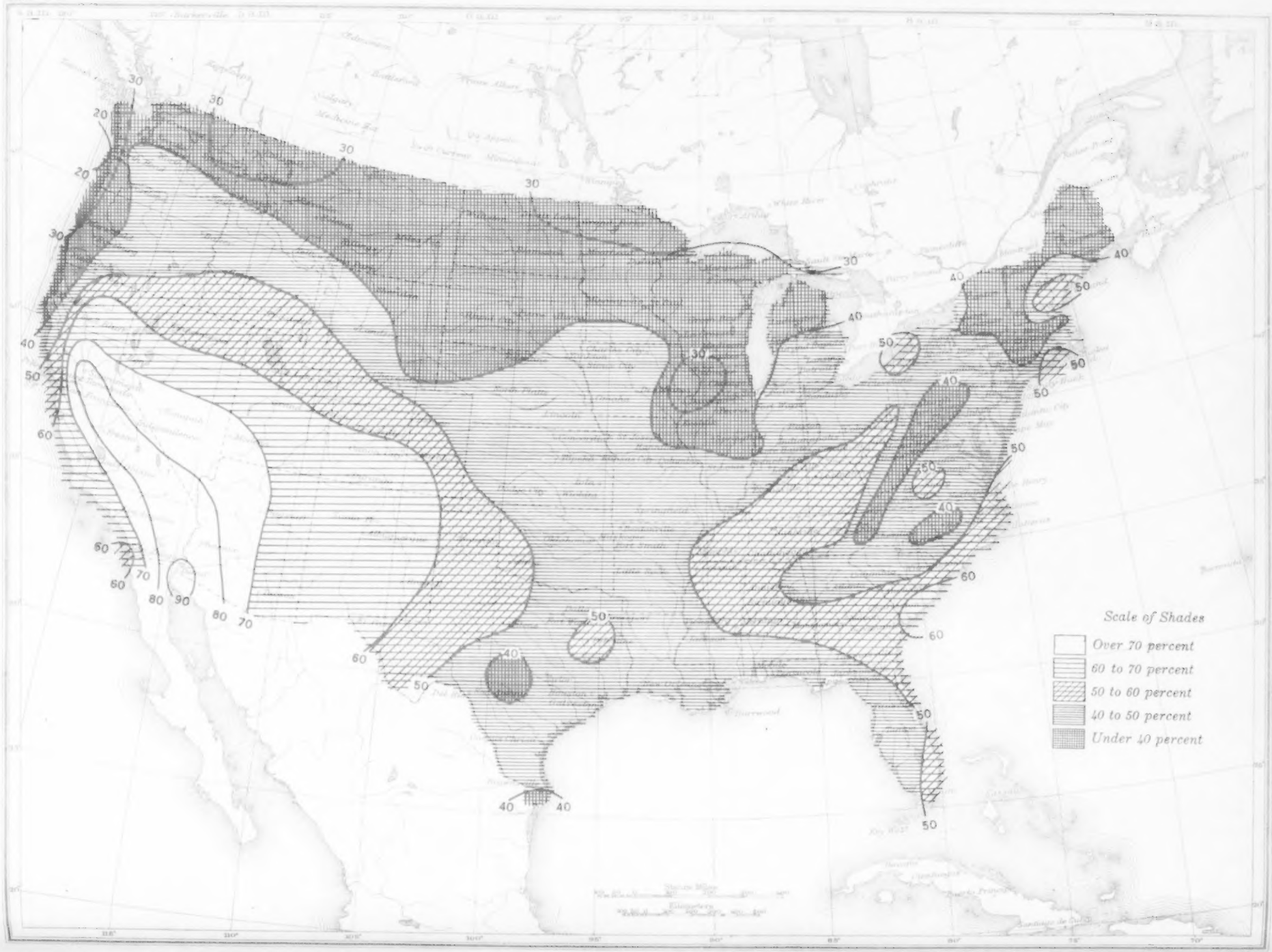



Chart V. Total Precipitation, Inches, June 1943. (Inset) Departure of Precipitation from Normal

Chart V. Total Precipitation, Inches, June 1943. (Inset) Departure of Precipitation from Normal

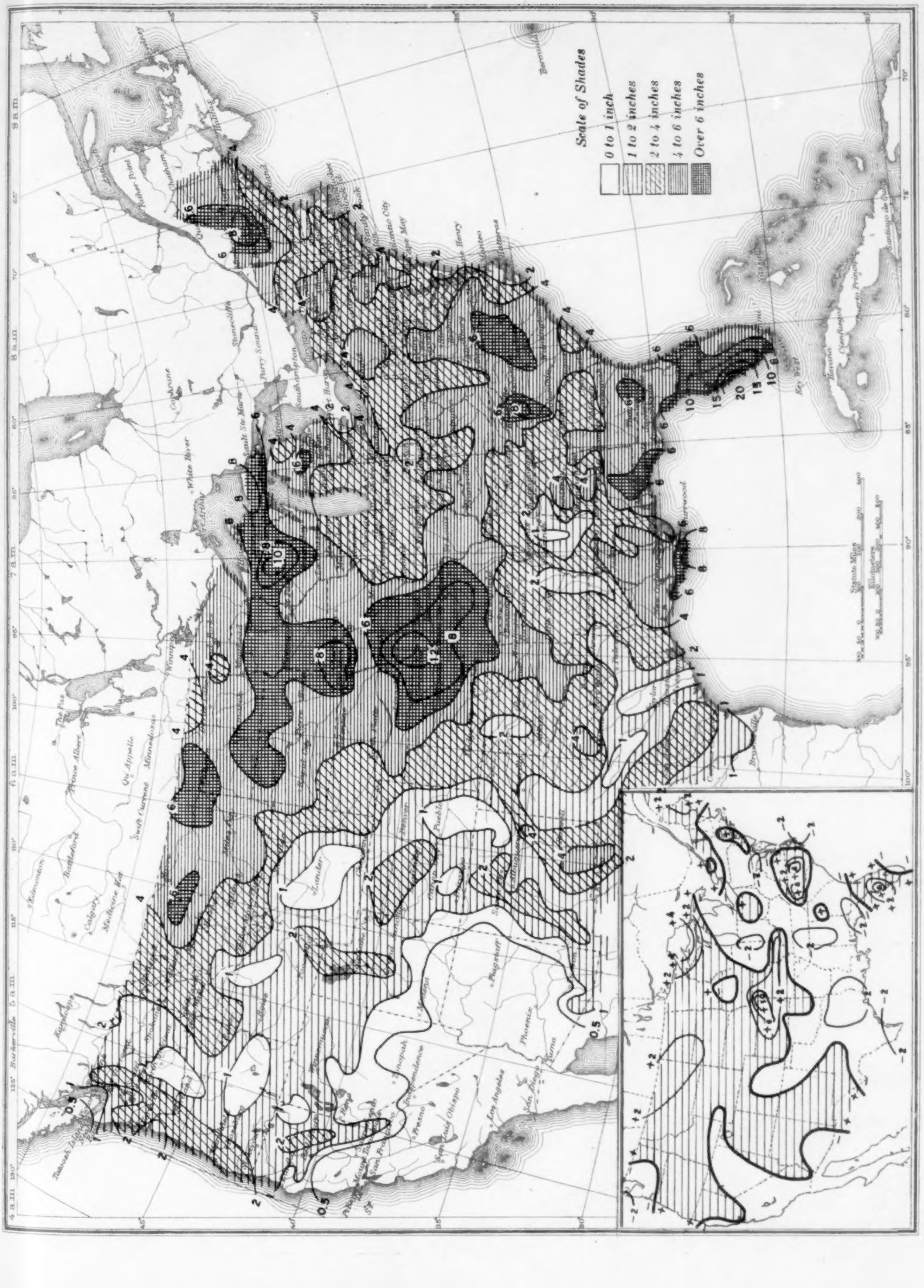
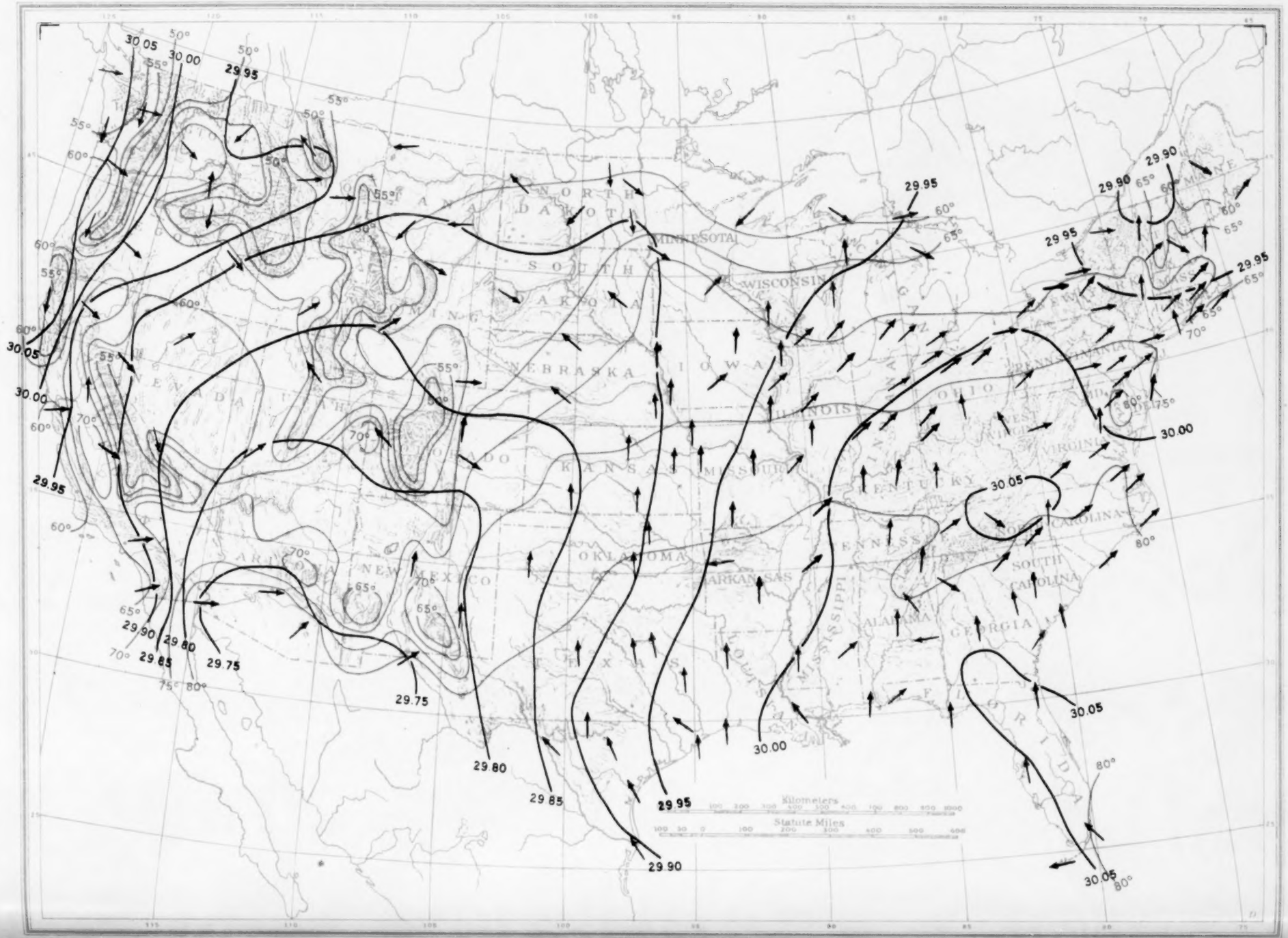



Chart VI. Isobars at Sea Level and Isotherms at Surface; Prevailing Winds, June 1943